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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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EDITORIAL NOTES.

The Bill through Committee Stage in the Lords.

THE House of Lords had last week several momentous questions on which they desired to express an opinion; and they were so engrossed by them that they had not then time to devote to the Bill which is to provide the way to the relief of the gas industry from its miseries, and to infuse new life into it. But subsequently it was decided that the Committee stage should be taken on Monday this week; and this came to pass. The Bill is now all but an Act, as the remaining formalities ought to be cleared away quickly. Certain amendments had been lodged for consideration by the Lords, the greater part of which were dealt with by us in our issue last Wednesday; but subsequently Earl Grey entered two or three additional proposals for modifying the terms of the measure. His Lordship was the instrument of the Association of Local Authorities in these matters; and he also had the backing of the railway companies. But he obtained no success, and very little sympathy. The amendments were such that, if they had been agreed to, they would have made a pressure of 2 inches obligatory in a pipe of any size—even less than 2 in. internal diameter—up to the inlet of the meter. His Lordship cannot possibly know the difficulties in practice for which he made himself responsible to give statutory countenance to if he could have persuaded the House to his way of thinking. Another amendment that he tabled had for its intention the insistence upon the inerts and carbon monoxide questions being inquired into within six months after the passing of the Act, instead of "as soon "as may be." Some people appear to be in a mighty hurry to get limitations imposed in respect of matters that have never before been subject to limitation. However, this was withdrawn, as was also a proposal from the same quarter that, in the provision requiring undertakers, in the case of an alteration in the declared calorific value, to take at their own expense such steps as may be necessary to alter, adjust, or replace the burners in consumers' appliances, the words "service-pipes and meters" should be inserted after burners. No one of these proposals finds place in the Bill; but all the other amendments put forward by the Marquis of Londonderry, on behalf of the Board of Trade, were accepted. These were noticed by us last week. For the most part they are drafting amendments, other than those that make it a penal offence to employ unstamped gas-meters, and provide for the competence of meter inspectors being assured by examination.

Last week we referred to the importance of clause 10 in relation to the development of gas undertakings, amalgamations, purchases, and concentration of gas manufacture for considerable areas. The policy of the Government in the matter of public utility supplies lies very much in the direction of concentration of production; and certainly the more this goes on within reasonable territorial limits the better will it be economically. From whatever point of view the matter is considered, there is wisdom in centralizing within a given district the production of gas, and in piping—if necessary under a higher pressure—the gas required in outlying districts. There are very rare instances of small gas-works, through location and circumstances of operation, manufacturing economically as economy is regarded in the larger concerns. The result of this is mirrored in the price charged relatively with that of a neighbouring large undertaking. We see the concentration policy of the Government in respect of public utility undertakings not only in clause 10 of the Bill, but in what has been, and is being, done in connection with the electricity supply industry. We see it, too, in the grouping of railway companies, and the co-ordination of their operations, with a view to economy. We further see it in the proposed regional working of coal mines. The gas industry is ripe for a very large extension of the centralization of production.

For this and for all the purposes dealt with in the Bill, the Board of Trade have power to grant authorization for the raising of money. Studying the Bill from the opening to the close, it is obvious that the Board of Trade is going to mean much to the gas industry in future. The powers of the Board will be extensive; and it is plain that Parliament, through this Bill, will be relieved of much detail work in connection with the industry. The time of Parliament will be saved; and in many respects gas undertakings will be able to submit their plans and requirements within the scope of the Bill to a body who will, with experience, become more and more specialized in the work appertaining to, and the needs of, the industry. This is all to the good for gas undertakings; and there will be money saving in being able to get so much through the medium of Board of Trade Orders—ordinary and special. Of course, Parliament will still have to be approached in respect of certain essential matters, and for concerns that require to rise from non-statutory to statutory conditions. But it is easy enough to see that the consulting gas engineer, who will be required as much as ever for all other professional purposes, will not, under the new order of things, have so many opportunities as hitherto for Committee room work. These opportunities have been a diminishing quantity through the years of the war; and we think there can be little hope of revival now that so much is to be entrusted—and properly so—to the Board of Trade.

Uniting the Forces of Chemistry.

THE war found this country with brilliant chemical talent and well-equipped chemical works, and men with great organizing power, when it stood never so much in need of talents and work. Had these not been of the country's possessions, there would not have been the great achievements and discoveries that there were during those painful and strenuous years, and the marvellous magnitude of the potentialities of chemistry would not have been so clearly seen as they were then. There is an ardent desire that all that was gained should be retained, and that potentiality should receive the best concentrated effort to cause it to be progressively revealed, and be brought into account as a new asset. At the head and front of this movement is Lord Moulton; and some information regarding it was heard the other night at a banquet at which he was the guest of a number of the leading chemists and chemical technologists, who presented him with a large silver loving-cup in recognition of the valuable services he rendered to the country and her Allies during the war.

On that occasion, Sir William Pope outlined the scheme which it is proposed shall assist in carrying out the object which lies at the heart of Lord Moulton, whose inspiration, initiative, and organizing powers, did so much to bring about the accomplishment of meeting the large and urgent need for explosives and chemicals required in the prosecution of the war. The objective of the new scheme is consolidation by, in the first place, the provision of a centre of unity and activity for chemical technologists. The estimate is that some half-million of money will be required to attain fulfilment. A moiety of this is to be utilized in providing in London general headquarters for the chemical organizations; and the other half is to be devoted to providing a laboratory and carrying out other contemplated work. The intention is to organize so as to bring the

different branches of the chemical industry into closer touch the one with the other; for by this route will come the attainment of the maximum good. The signatories to the appeal will include not only the Presidents of the various Chemical Societies, but of most industries relying largely upon chemistry, including that of gas supply. The signature of Lord Moulton will stand at the head; and, this being so, after the wonderful response to the call he made in 1915 in the name of the country, there is good certainty that success will attend this new endeavour to promote the country's success and prosperity.

When Director-General of Explosives Supplies, Lord Moulton, in courteous and generous language, showered encomiums upon all those who came to his aid in carrying through to a definite goal a work which he was so well gifted to undertake. His was the mind that conceived; his was the mind that unobtrusively directed; his was the voice that asked with a confidence that knew that asking he would receive; his was the personality that made men feel that he and they were colleagues working together to one glorious end. He was a power in the land; and he achieved where politicians would have failed. His remarkable faculties were all brought into play; and, as Dr. Emil Mond said at the banquet last week, his fortitude and genius never flagged. He has been liberal in his recognition of the work of other men; it was time that the other men made recognition of the work of the man. The chemical leaders have done this. During his tenure of office in the Munitions Department, as the gas industry found in his Presidential Address to the Institution of Gas Engineers, his Lordship was remarkably observant. He frankly told the gas industry of its defects and faults, and pointed the ways he conceived to be those of salvation, and of greater utility in the service of man. We cannot complain; for we are conscious of the truth of what he said. The other night he asked the chemists, Whose fault is it that before the war we were so dependent upon Germany? There immediately came the clear reply from the lips of the questioner: There was not the same unity among chemists as among the other industries and professions. They did not assert their essential importance? Why should not they announce to the world that they are at the root of the nation's prosperity in industry? His advice is, let them unite, hold high the standard of chemistry and the chemical industry; and, if this be done, he sees a brilliant future before them—not only industrially, but in the respect that will be paid to their profession by the nation. If the appeal which is now to be made, with Lord Moulton's signature leading, causes to be materialized his aspiration for uniting the whole forces of chemistry so as to bring their combined agency to the work of protecting the achievements of this country, and of giving life, through chemical agency, to much of that which is still latent, he will, we are sure, regard it as a worthy crowning of the distinguished work that he accomplished during the war with a modesty that befits such greatness as his.

Gas-Power Facts and Uninformed Electricians.

THERE would be much less friction and trouble between the gas and electricity supply industries if electrical men, instead of trying to poise imagination against fact, and set postulation above proved things, would inform themselves as to the actual position of the gas industry in relation to their own doings. Looseness characterizes their statements, and in some cases (we are inclined to think) designedly so, in order to escape the unpleasantness of acknowledging a truth or fact which, in the interests of their own industry, if not of other people, they would rather was non-existent. To selfishness and a disinclination to acknowledge the existence of superiority in any respect is due much of the pretence that is found in the world to-day. But where fact is, then pretence cannot long survive. And electrical pretence in relation to the doings of electricity, and the comparative performances of gas, is so very obvious that it would be far better to abandon the policy, acknowledge the truth, and let matters settle on to their destined beds, as they are bound to do sooner or later, despite all electrical resistance. Facts are not hidden from the public, by interposing word-spun statement, which is too diaphanous, and has no durability.

In the written reply (published in the "JOURNAL" last week) to the discussion that took place recently at the Institution of Electrical Engineers on the summary of the case he prepared, in collaboration with Professors Smithells and Cobb, to show the relative positions of gas and electricity in relation to coal conservation, Sir Dugald Clerk regards the attitude of the electrical engineers on the occasion as most gratifying; and this leads him to hope for a better understanding and more co-operation in the future than there have been in the past. We join in this hope, but with a certain amount of misgiving. If the electrical men were all Roger Smiths, Wordinghams, Cromptons, Merzs, Highfields, and others, we might have an intensified hope. These are the type of men with whom Sir Dugald had to deal in the discussion; but, though of the electrical profession, they do not in many ways represent some of the other units of that profession, nor the electrical commercial men, nor the electrical writers with whom the gas industry in its operations has to deal. The speakers represented those electrical men who are broad-minded, and who do not suffer from the obsessions that have grown thickly about many of their colleagues. Nevertheless, even they, through want of proper information, made statements which misrepresent the position. As we said on a previous occasion, they evaded the capital issue of thermal efficiency in relation to coal conservation. They were not to be drawn into any specific admissions in regard to heating, though there were confessions in respect of water heating. But misstatement misrepresents, whether the misstatement be the product of ignorance, or pretence that the facts are otherwise than actually exist.

Part of Sir Dugald's reply is directed to correcting misstatement in relation to the power position, in respect of which no one can accuse the gas industry of not making due acknowledgment of the extensive and important part of electricity in the power field, while putting forward, upon the testimony of living facts, the position of gas in that field. There is no virtue in attempting to cut away the credit of gas performance by prominent reiteration over and over again of points which the gas industry has frankly and freely admitted, and continues to do so. The great utility and convenience of the electric-motor, and its economy for some purposes, have all been granted—being facts beyond dispute. But what do electricians say on the other side? They put forward brake efficiencies for gas-engines which may apply to some old-fashioned types; they attribute extravagant losses of efficiency to varying load; and they speak of difficulties which may have some measure of truth so far as these same types are concerned. But is this playing the game? Is it quite fair to by-pass the more modern engine and so the modern performance in order to make a point, without the slightest qualification? Sir Dugald, in his reply, gives figures as to brake efficiencies—not figures obtained under specially favourable conditions—to controvert what was said on the other side. "Almost any good modern "horizontal gas-engine will give 30 p.ct. brake efficiency at "full load, and will run with little fall down to one-third "load." This is a statement that is demonstrably true. If the electrical men who spoke of 20 and 25 p.ct. efficiencies have doubt as to the accuracy of Sir Dugald's knowledge in this regard, the doubt can easily be set at rest by tests on engines under working conditions. Then there is the categorical statement that Sir Dugald makes, that much more than a million horse power of gas-engines are at present in use in Great Britain—many of them operated by coal gas. Is this true, or is it not? If true, and we have Sir Dugald's word that it is, then our electrical friends have to face the fact that a large number of the engines are of modern type, and are working at the high efficiencies named, and so economically. Calling attention to the inverted vertical gas-engine (which has been rapidly introduced during the past eight years), Sir Dugald points out that one firm alone has supplied over 100,000 B.H.P. in these engines in units of 500 to 3000 H.P. The engines are largely employed for generating electricity at collieries and other places. It is well to emphasize that these last quoted figures are from one firm alone (not from the whole number), and for only one type of engine. Electrical men might also note that the engines are used for the generation of electrical energy; and we do not see any signs that the collieries are anticipating scrapping their private plants, which enable them to utilize profitably some of their waste fuel in favour of supplies of energy from a station probably some distance away, to which fuel has to be carried, and the electrical energy has to be transmitted back by cable. As to the small gas-engines, the ever-increasing output of engines above (say) 5 H.P. shows that manufacturers do appreciate them. Why is there this increasing output and purchase if gas for power is a "back number?"

These are facts which cannot be refuted by words. Electricians must not make the mistake of passing judgment on the gas power position (as some of them appear to be doing) by the evidence of the popularity of the electric-motor for small powers. "The only effect," remarks Sir Dugald, "the electric-motor has had on the gas-engine "industry so far is to push-up the average power of indi- "vidual gas-engines. At a certain power it becomes more "economical to use a gas-engine for a small works than an "electric-motor; and accordingly gas-engines are so used in "very large numbers." These are facts of which even some of the foremost men in the electricity supply industry either have little knowledge, or else they successfully affect profound ignorance of the subject. Whichever is true, the position or attitude is to be deplored, for it helps to make things unpleasant, though it does not alter the facts.

Mutual Interests.

THOSE of our readers who perused the much abbreviated account that we published last week of the proceedings at the meeting of the Society of Chemical Industry will have been struck by the growing recognition that is being made of the extraordinary extent to which the interests of the chemical, gas, and coke-oven industries are interwoven. At one time, only on rare occasions were papers presented to the Society that claimed our consideration, and then they dealt with topics that have become positively archaic with advancing time and new development. Now the technical men of the chemical industry show a much deeper concern in the productive work of both the gas and the coking industries; for these are the sources of much of their essential raw materials, and of much chemical employment. The gas and the coking industries are becoming more and more chemically investigated, guided, and controlled; and they have also between themselves much in common—not only in the technical and commercial work associated with tar, ammonia, and benzol, but in respect of the utilization of the gas produced by coke-ovens. The Gas Regulation Bill, wherever the proximity of a coking plant to a town admits of an alliance, should bring about a considerable increase of business between the two industries.

There has now been large experiences of this at Middlesbrough, Sheffield, and Leeds. Mr. H. E. Wright told the meeting much about what has been done at Middlesbrough, and what has been done is excellent, and the gas consumers have realized advantages which geographical situation, and in some cases other causes—such as lack of imagination and enterprise—have denied to other gas consumers. But there may be correction of the idea that Middlesbrough, in enjoying gas to-day at 2s. 4d. per 1000 c.ft., is not beaten in price by ordinary gas-manufacturing plant. Sunderland can give the contradiction to any such assumption. The use of coke-oven gas for urban purposes is, however, all a question of local conditions. Moreover, gas undertakings, being fuel and light suppliers to communities, must protect these communities against cessation or reduction of supply, through strikes or the falling-off of the demand for metallurgical coke, by the provision of gas-making plant *in situ*, which in such cases may possibly be secured at a cheaper rate per unit of production than ordinary carbonizing plant by the installation of plant for the complete gasification of coal. This protection should be an item in the consideration of the basis of gas purchase in bulk. Where business alliance is practicable between a coking plant and a gas undertaking, we agree very much with Dr. E. W. Smith that the owners of the former should ascertain whether it would not be more profitable to heat their ovens and boilers with producer gas and sell the whole of their ordinary gas production per ton for town purposes instead of only about one-half of it. The future sale of gas for domestic and industrial purposes on the heat-unit basis, and the fixing of a "declared" calorific value of gas according to the economic conditions of the local gas supply, give greater latitude to the use for town purposes of the whole production of coke-oven gas. If the owners of coking plants can sell their gas at a higher price than it would cost them to provide producer gas for their own heating purposes, then there would be profit in the transaction. In some districts, but not in many, it would pay gas undertakings (as it does at Birmingham) to have a section of carbonizing plant of the coke-oven type to meet the local demands for metallurgical coke; but this, of course, would depend upon the proximity of other coke-oven plants to the seat of demand.

Our electrical friends should be much interested in Messrs. Hewson and Fowler's paper. They profess a disbelief in the gas-engine efficiencies advanced by those who have lately been speaking on the subject of the relative thermal efficiencies of gas and electrical operation. The paper gives some perfectly independent testimony. Knowledge has been making good strides as to the best conditions for the use of blast-furnace gas for gas-engines. With engines using 10,000 B.Th.U. per brake horse power, an efficiency of 25·5 p.ct. is realized. If this is the case with clean blast furnace gas, there are no difficulties in the way of securing even a higher efficiency (say, 30 p.ct.) with town gas. But the blast-furnace gas must be clean; and with cleansed gas, two engines that were examined after a 15,000-hour run were found to be perfectly clean. This means a good deal in the matter of maintenance and repair. Another noteworthy point in this connection is that the Newcastle Electric Supply Company have been employing gas-engines instead of using blast-furnace gas under their boilers; and they are getting double the units from the gas consumed direct in engines instead of indirectly under the boilers for steam-raising.

Returning to the original thought, the points we have made show sufficiently—even substantially—the mutuality of interests that exists between the three industries. The more this is recognized, and the more it is developed, the better for those industries, and for the country at large.

The Awakening.

THERE are signs of an awakening to the realities of the present position in some places in the labour world. The policy of labour is recoiling upon itself. It was seen in last week's issue how the Industrial Court (which represents masters and workmen) issued a sharp rebuke in connection with the demand for an additional 6d. per hour by the Engineering and Shipbuilding Unions. The demand was refused; and the ground of refusal was that the economic position—the position of values—would not permit of the extra money being paid. There are already indications of a falling-off in branches of the trade; and the Court took this into account. There is no exaggeration in their submissions—particularly in relation to shipbuilding. Many shipowners have cancelled orders. It is folly to push on with the construction of ships when there is congestion at the ports, and ships are making outward voyages without cargoes. The Select Committee on National Expenditure, in their last report, deal with the operations of the Ministry of Shipping. They attribute the congestion at the ports to the eight-hour day, and to the general working conditions. But a most vital condition which cripples merchant shipping is the deficiency of coal for export. A year's export before the war was 73,400,113 tons, not including bunkers; while the amount during the current year will only be from 20 to 25 millions. The demand for shipping for coal-carrying is so much less; and moreover the high cost of bunkers seriously affects freights.

These conditions are causing the Seamen and Firemen's Union to think; and, thinking, there is at least one important leader in that body who has the courage to place at the right door the blame for the unemployment of a large body of seamen and firemen. When labour awakens, and examines the conditions for itself, and sees where the policy of excess leads to, things will become more hopeful. Apart from the shock administered by the Industrial Court, we see that Mr. Matthew Tearle, the Secretary of the Cardiff branch of the Seamen's and Firemen's Union, has been giving utterance to some very plain and intelligent views on the causes of so much unemployment among the Cardiff members of the Union. The miners' leaders are rushing about the country ranting about Russia; and Mr. Tearle's view is that they would be doing infinitely more good to labour if they devoted their time to preaching the gospel of increased coal production. The miners' leaders have heaped upon them the whole blame for the stagnation in Cardiff; and we are supremely glad to see it. The colliers were supplied with food brought by the seamen across the seas during the perilous years of war; but these very seamen are to-day starving for want of employment—due to miners' wages and hours being considered more important than production. The gentlemen who work in the mines—who are fattening on big pay per seven-hour day, and are proposing to turn over to a six-hour day next year—only raise sufficient coal to allow a meagre quantity to be exported.

They do not care. It is all part and parcel of the plot of the extremists to gain their ends through economic ruin, which is the last thing the rank-and-file can desire. But in their ignorance they make willing tools. We hope before it is too late a good many Matthew Tearles will arise in the labour world, cry a halt, and prove the necessity for a change of policy. The warning voice from Cardiff suggests that it is up to every Briton to maintain the nation's predominance. He urges work for at least eight hours per day until the country reaches pre-war prosperity, and until exchanges are levelled-up. By doing so, the men who fought for the country will have a chance.

In the organ of the General Federation of Trade Unions, an article appears which shows that in other labour quarters there is growing impatience over the autocratic methods of the miners and railwaymen; and their responsibility in adding to the increased cost of commodities is pointed out without any ambiguity of meaning and intention. The comment is so striking, as illustrating the growing discontent in parts of the labour world with what is happening in other parts, that the following quotation is worth giving:

> It is ridiculous for the Miners' Federation to assert that the advances they have received have been taken out of profits. The miners' increases have been taken out of the pockets of the consumers; and in Britain alone there are 42,000,000 consumers, 40,000,000 of whom belong to the working-class, and who are being victimized just as surely as their richer brethren. The action of the miners has not only increased the discomfort of the people and jeopardized their health; it has increased the cost of production and the corresponding difficulty of selling abroad sufficient manufactured goods to pay for the food the people must import.
>
> The railwaymen have been more open in their attacks upon the pockets of the rest of the community. Members of their Executive quite frankly emphasize their intention to make the public pay; and, with the aid of the Government, they have carried out their intentions. Here there has been little subterfuge. Quite openly the National Union of Railwaymen has gone out to get the money, knowing all the time that, so far as passenger traffic was concerned, 80 p.ct. of it would be paid by their fellow-workers, and that indirectly the whole of the charges for the transit of goods would be paid by the same class.

One hopes these incidents may be taken as indicative of a great and beneficial awakening in the labour world.

Touching the complaint of the Seamen and Firemen's Union (to which reference is made in the second paragraph of this article), we see from the Board of Trade returns that the total shipment of coal last half year was 14,431,533 tons, compared with 35,526,235 tons in the June half of 1913 and 18,563,054 tons in the corresponding period of 1919. Of the six months' exports, gas coal accounted for 1,095,556 tons, compared with 5,510,408 tons in the corresponding period of 1913, and 1,676,130 tons in the first half of 1919. Under the heading of coke, 996,101 tons were shipped in the past six months, compared with 499,670 tons in the corresponding period of 1913, and 593,140 tons in 1919. It is evident that coke has to-day a good absorbing market abroad.

A Private Bill and Gas Regulation.

The Chairman (Mr. Charles Hunt) and the Directors of the South Suburban Gas Company have taken a wise step. Now that the Gas Regulation Bill has advanced so far on its journey, and there is good prospect of an almost immediate passing, they have withdrawn the heat-unit and charges clauses from their Bill, and have left in it only the land and capital powers and general provisions. It is considered by the Directors that the terms that will be secured through the Board of Trade will be equally as good as, if not better than, their own proposals. As a matter of fact, the position in regard to costs has undergone considerable change—for the worse—since the Bill was introduced. There were three points which led to the introduction of the clauses in the Company's Bill. The first was that the Directors did not wish to lose time, and there was, at the date the Bill had to be deposited, uncertainty as to when the Board of Trade measure would be presented to Parliament. The second point was that there was then no knowledge as to the form the Board of Trade Bill would take; hence the preparation of a scheme by the Company with as the basis the Fuel Research Board's recommendations as to charging for heat units. The third was that the Company were not in accord with one feature of the National Gas Council's then proposals as to revision of the sliding-scale, in view of the economies which the Company hope to realize ultimately at their new works at Belvedere. This feature had reference to the variation of the standard price according to the alterations in the cost of coal delivered on to the works, which matter was discussed in the "JOURNAL" for Dec. 23 last, and subsequently references were made to it in our "Correspondence" columns by Dr. Carpenter and Mr. Hunt. However, the shortened Bill is now proceeding without opposition; and, in respect of the heat-unit basis and revision of the sliding-scale the South Suburban Company are now to go through the normal procedure *via* the Board of Trade.

The Miners' Claim Refused.

If threats go for anything, there is to be trouble with the miners. This is what has to be anticipated, while sincerely hoping that good counsels will prevail; and that nothing of the kind will happen. The Government have given a flat refusal to the Miners' Federation claim on behalf of the men for a 2s. per day increase of wages for all workers over 18 years of age, and smaller amounts for workers under that age, with 14s. 2d. per ton reduction in the price of coal to domestic consumers. The refusal was conveyed through Sir Robert Horne on Monday, when he made it clear to the delegates of the Federation that whatever surplus there now is must go to the Exchequer. Otherwise coal will contribute nothing in lieu of the excess profits duty, which has to be borne by all other industries, as the miners' proposals would exhaust the whole of the surplus coal profits. It must be remembered, too, that whatever surplus there may be is not derived from home sales, but from the higher prices obtained for export coal, so that the home consumers are not paying the excess. Moreover, there is not the slightest justification for the miners' claim to additional wages, seeing that the advances they have already received total to a percentage higher than the increased cost of living, and they have the privilege of obtaining coal at an absurdly low price. A general conference to consider the position is to be convened by the Federation for Aug. 12. The leaders say the final decision must rest with the men. That "there will be a row" is the firm conviction of one of the members of the Executive of the Federation; but what form the "row" will take is left to surmise.

Road Tarring and Horse Traffic.

The tarring of the surfaces of roads has been the subject of long experience; and as an abater of dust and a preservative of road surfaces, and so an economizer in the matter of maintenance, it has no equal. Now after these long years of use, horse owners appear to have come to the conclusion that tar-surfaced roads are not suitable for horse traffic, although they may be excellent for motors. The Ministry of Transport has taken up the matter; and we learn, from what transpired at a meeting of representatives of the leading horse-breeding societies last week, that the question of the best surface for horse and motor traffic, having regard to road preservation, is to be the subject of investigation. As Mr. Riche, the Secretary of the Roads Improvement Association, told the meeting, some sort of preservative there must be. Something of a happy medium has to be found which will serve both horse and motor traffic, and perhaps the Slippery Roads Committee of the Ministry of Transport will be successful in their quest. We would suggest, however, that the investigation should not be confined to the road-surfacing material. The character of the construction of the road may affect the surfacing. It would also be as well to inquire into the shoeing of horses, to ascertain whether the proved advantages of road surfacing cannot be accompanied by a suitable form of shoe for horses. It may be a question more of shoe than of tar. Sir Henry Maybury is taking an interest in the matter; and no one has more experience than he of the value of tar on roads.

Meter Dial without Hands.—Mr. W. D. R. Evans, of Canton, Ohio, suggests for use on gas-meters a dial which has no hands; but a disc with the necessary figures on it revolves under the dial—the consumption being shown through holes in the dial proper. The disc does not revolve as the gas passes through the meter, but only at intervals. After 100 c.ft. (say) are registered, it stays there until the 200 c.ft. is reached, and so on. There are no figures to read, except the consumption shown at the time; so that the device would prove to be a time saver. The mechanism is not yet perfected; but it will be similar to that of a speedometer.

PERSONAL.

At their first meeting of the new session, the Council of the Royal Society of Arts elected Mr. ALAN A. CAMPBELL SWINTON, F.R.S., as Chairman for the ensuing year.

After having been connected with the Townsville (North Queensland) Gas and Coke Company, Ltd., for thirty years, Mr. W. A. LEIGH retired last September from the position of Secretary, which he had held for ten years. He has been succeeded by Mr. H. ROBERTS.

In consequence of having obtained another appointment under the Birmingham Corporation Gas Department, Mr. H. W. DEAN has resigned the Hon. Secretaryship of the Midland Junior Gas Association; his successor being Mr. B. J. Bell, of the Gas-Fittings Department of the Birmingham Corporation.

Mr. H. T. ADKINS, the Assistant Secretary of the Primitiva Gas Company of Buenos Ayres, has, we regret to learn, had a somewhat serious breakdown in health. He retired on June 30, and was almost immediately afterwards attacked by illness. Some improvement in his condition is already reported; and it is hoped that this may be progressive.

Mr. JAMES WHYTE has retired from the managership of the Seaham Harbour Gas-Works, after 47 years' unbroken service with the Seaham Gas and Lighting Company. He has occupied the position of Manager since the formation of the Company in 1873. Until the end of last year, he was actively engaged in his duties, although in his 84th year. Unfortunately, recently ill-health developed, and he has been compelled to relinquish the position. He is succeeded by his son, Mr. W. J. WHYTE.

Lord MOULTON was the guest of a large number of British chemists and chemical manufacturers at a dinner at the Savoy Hotel last Wednesday, and was the recipient of a piece of silver plate, which was handed to him by Dr. Emil Mond, in recognition of his eminent services as Director-General of Explosive Supplies. Sir William J. Pope (Professor of Chemistry at Cambridge University, and the new President of the Society of Chemical Industry), who occupied the chair, announced that an appeal was about to be issued, under the leadership of Lord Moulton, for the erection of a central headquarters to house all the various chemical interests—scientific, technical, and commercial.

Cornish Association of Gas Managers.

The Summer Meeting of the Cornish Association of Gas Managers was held at Falmouth last Thursday, the 22nd inst. The Mayor of Falmouth (Councillor Charles Spargo, J.P.) welcomed the members on behalf of the town, and placed the council chamber at the disposal of the Association for the business meeting. The members and their lady friends to the number of about thirty were entertained to luncheon, and afterwards to a steamer excursion to view the section of the Atlantic Fleet at Falmouth—finishing with tea at St. Mawes. In the absence of the Chairman of the Falmouth Gas Company (Alderman F. J. Bowles, J.P.), through a family bereavement, Mr. John Chard presided over the luncheon, and welcomed the guests on behalf of the Directors of the Falmouth Gas Company.

Exact Methods of Gas Analysis.

A series of articles on this subject appeared, from the pen of Herr E. Ott, in early numbers this year of the "Journal für Gasbeleuchtung." From a summary printed in the current issue of the "Journal of the Society of Chemical Industry" in seems that the author gives full details of his gas-analysis apparatus of the constant pressure type, with control tube—the gases being stored over mercury. Carbon monoxide and hydrogen are estimated separately or together by burning in contact with platinum wire at 300° C.; the wire or wires being enclosed in a silica capillary tube, which is preferable to a platinum tube, being non-porous and less expensive. Methane does not combine with oxygen at 300° C., but commences to do so at 400° C., burning completely at a bright red heat. Measured quantities of the pure gases were mixed together, and check analyses carried out by (1) completely burning all the gas and measuring the oxygen used up and the carbon dioxide produced; (2) by absorbing the carbon monoxide first with ammoniacal cuprous chloride, followed by fractional combustion of the methane and hydrogen; and (3) by fractional combustion, first of the hydrogen and carbon monoxide together, followed by that of the methane. The apparatus and method of manipulation were described in detail, together with the results of the check analyses. The platinum wire must, it is explained, be revivified or replaced from time to time.

The 1918-19 report of the Fuel Research Board, the main portions of which have been reproduced in the pages of the "JOURNAL," formed the subject of an article by Prof. John W. Cobb, in the issue of "Nature" dated July 1. The main features of the report are well presented by the author, who remarks that the results which Sir George Beilby, Prof. Thomas Gray, and their staff are setting-out to obtain in connection with the low-temperature carbonization process will be of great interest to many who have been waiting for trustworthy data concerning it.

ALKALI WORKS CHIEF INSPECTOR'S REPORT.

IN the fifty-sixth annual report (covering the work done during the year 1919), Mr. W. S. Curphey, the Chief Inspector under the Alkali Works Regulation Act, again devotes much attention to sulphate of ammonia and gas liquor works; but this portion of the report [which has come to hand as we are going to press with this issue of the "JOURNAL"] must be left over for future notice.

REGISTERED WORKS.

The number of registered works in England, Ireland, and Wales was 1403, in 62 of which operations were carried out which brought them within the definition of "alkali works." Compared with the preceding year, there was a decrease of two in the number registered as alkali works, and of nine in the number otherwise registered. There were also 165 works in Scotland registered under the Act, making an aggregate of 1568 for the United Kingdom, which compares with 1580 in 1918. The number of separate processes of manufacture under inspection last year was 2288, against 2352 in the previous year. The number of visits to works and of tests made was the same as in 1918. No proceedings were instituted to recover the penalties incurred through emission of noxious gases or vapours in contravention of the provisions of the Act. There were some complaints made, particulars of which are given in the report.

A fatality, due to the effect of inhaling noxious gases lurking in a tar-still plant after a completed charge had been run off, occurred at the end of the year. In this case, a man entered the plant contrary to specific orders, and before the still was considered by the management to be in proper condition for entry. Strenuous efforts were made to rescue the victim; and two or three men were gassed in consequence. These recovered subsequently; but their efforts were unsuccessful in removing their comrade in time to permit of his resuscitation. The deceased had been employed on similar duty for three years previously, but entered the still within three-quarters of an hour of an order that on no account was the plant to be entered that day, as it was not ready, and precautionary measures would require to be taken before any one entered it.

SULPHATE AND MURIATE OF AMMONIA AND GAS LIQUOR WORKS.

The number of works registered as sulphate and muriate of ammonia works for 1919 was 632, the same as in 1918; and the number registered as gas liquor works was 107, a decrease of 4 as compared with 1918. The reversion to the manufacture of sulphate of ammonia from the production of concentrated liquor continued during the year, and is the reason for the reduction in the number of gas liquor works registered. In some cases the prices obtained for gas liquor, combined with the cost and trouble of operating very small sulphate of ammonia plants, have led to some of these being stopped for the time; and this development has reduced the number registered as sulphate of ammonia works below what it would otherwise have been.

The following figures show the quantity of ammonia products manufactured in the United Kingdom as a bye-product in the various industries named.

Ammonia Products Manufactured in the United Kingdom (expressed in Terms of Sulphate, 24½ p.ct. NH_3)—Tons.

From Liquor Produced in—	1919.	1918.	1917.
Gas-works	173,501	173,541	188,478
Iron-works	10,877	12,717	13,621
Shale-works	48,618	58,311	60,560
Coke-oven works	144,367	164,448	166,354
Producer-gas and carbonizing works (bone and coal)	20,150	23,534	29,604
Total.	397,513	432,551	458,617

*** Of the above total quantity of ammonia products, the equivalent of 34,738 tons was manufactured as concentrated ammoniacal liquor; the balance of 362,775 tons consisted of other ammonia products (sulphate, chloride, nitrate, &c.).

The noxious gases evolved in the distillation of crude ammoniacal liquor were disposed of satisfactorily by the methods in use in past years. The oxide of iron purifier continued to be the most frequently used means for absorbing sulphuretted hydrogen—the most noxious and offensive constituent of the waste gases. In one works where these gases were utilized directly for the manufacture of sulphuric acid from the sulphuretted hydrogen present in them, it has been found that the additional chamber-space required owing to the comparatively large proportion of inert gases seriously impaired the capacity of production of the sulphuric acid plant as a whole. It is therefore under consideration to substitute oxide of iron purification for the direct burning of the waste gases, and by this method still utilize the sulphur retained in the purifiers for sulphuric acid manufacture, while avoiding the unnecessary dilution of the chamber gases which arises when the waste gases as a whole are admitted to the chamber process. In this way, the reactions in the chamber process will be speeded-up, and the capacity of the existing acid plant will be materially increased.

Mr. Littlefield's report on District IVa. contains the following

remarks upon the development of Prof. Cobb's process during the year:

> This process has been tried on the working scale for the production of 1 ton of sulphate of ammonia per day. Its working has been technically successful; and the plant is at the present time under modification for the securing of greater commercial efficiency as regards the costs in labour and power.

The production of high-grade sulphate of ammonia received much attention in many works, and considerable quantities of dry neutral sulphate were made. The advantage of such salt over the older product containing acid and moisture, in proportion sufficient to influence the physical condition and corrosive tendencies of the commercial salt, are now widely recognized; and the demand for the highest grades may be expected to increase in the home market as well as for export purposes. So far methods for washing the solid salt by ammoniacal liquors of one kind or another have been most frequently brought into use.

On the completion of the armistice, large stocks of concentrated ammoniacal liquor were being held; and as the cessation of the large production of high explosives at once took place, no immediate use could be found for these stocks. Much was again distilled for the manufacture of sulphate of ammonia. In one works where the existing sulphate plant was already fully occupied, sulphate was made in an improvised plant from the purified concentrated liquor. Complaint was made against the works in question, when inquiry showed that, though no sulphuretted hydrogen was discharged, yet the concentrated liquor contained pyridine in sufficient quantity to be offensive. This is the first instance in which pyridine has been recognized as the chief offender in the manufacture of sulphate of ammonia. Means were taken to deal with the cause of offence, which was of a temporary character.

Water-sealed change-valves for use where two or more purifiers are provided constitute the best means for directing, as desired, the passage of the waste gases from the saturators to any particular purifier or purifiers. An early type of such valve introduced many years ago is open to objection as permitting a temporary escape of noxious gases while altering the position of the connecting-pipe to direct the waste gases to another purifier, and as being more dangerous while being handled than those of later type, which prevent escaping foul gases during the operation of changing connections from one purifier to another.

At one works, on the occasion of a visit from Mr. Littlefield, the purifier in use was beginning to show signs of fouling; and the works manager gave the sulphate man instructions to change-over to the other purifier which was ready, and in reserve. Mr. Littlefield's report continues:

> He proceeded to do so, using for the purpose a rope and two-block pulley attached to a small crane erected and fixed for the purpose. In the act of turning round the inverted U-bend connecting-pipe, the man must have inhaled deeply of the sulphate of ammonia saturator gases; for, without completing the change-over, he staggered and fell to the ground, presenting the usual symptoms of suffocation. The completion of the change-over was promptly effected; and I immediately commenced artificial respiration on the patient. After about ten minutes' work, the man began to breathe, and presently regained consciousness.
>
> This type of water-sealed valve is undoubtedly a dangerous one. I venture to think that, had not skilled assistance been instantly available, a fatality was highly probable.

It is true that these valves have continued in use for many years, and a disinclination to part with the arrangement has been encountered. But the danger is undoubted, as Mr. Littlefield's experience proves. In the event of injury or a fatality arising from the manipulation of such valves, those responsible for the control of the works would be in a most serious position.

The "direct" and "semi-direct" processes, in which the ammonia present in the gas generated from coal by destructive distillation is removed by the action of sulphuric acid, continued to give satisfactory results in coke-oven practice. In the conditions existing in gas-works, however, the experience was different. The problem of gas purification does not necessarily arise in coke-oven works; but in the smaller gas-works, especially, the additional and continuous care required by a process in operation at all times is less attractive than one in which gas liquor is distilled as occasion and convenience require, and one by which the efficiency of gas purification is less liable to be affected. There is therefore a tendency to revert to the older style of working. This tendency has already led to change in some cases; and further instances of a similar character are probable.

Tar Works.

The number of this class of works upon the register was 376—an increase of 1 over 1918.

A fatality occurred in one works of this class, to which reference has already been made. In the course of the inquiry into this case, reference was made to the use of respirators. In the absence of definite information as to the particular gases or vapours and the relative amounts of these which may have prejudicial effects, it is desirable to regard the use of respirators with the greatest reserve. Indeed, it may well be that the use of a respirator, through causing a sense of false security, might be a positive additional source of danger were it unsuited to the particular vapours, &c., to which its wearer proposed to expose himself. In cases of the kind, thorough ventilation prior to, and during, the period of exposure to adverse conditions is much to be preferred.

There were active trade conditions throughout the year; and the stocks of pitch existing in some localities at the end of the previous year were greatly reduced.

The adoption of plant for dehydrating tar for road purposes and the like increased. New plants for the complete distillation of tar were also erected, four of which were of the continuous distillation type. On the other hand, in four works operation of the tar plant was suspended owing to difficulty in obtaining the necessary labour.

The methods used for preventing the escape of noxious gases continued without change; and the means provided were maintained in satisfactory condition, save in one case. Here, the matter has been receiving attention for some little time, and improvements were in progress at the end of the year to ensure satisfactory conditions.

Tar and Pitch in the United Kingdom.

	Tons.
Tar distilled in—	
Gas and coke-oven works	1,402,987
Other works	106,056
Pitch produced in—	
Gas and coke-oven works	636,435
Other works	61,855

Report for Scotland.

It is stated in the report presented to the Secretary for Scotland that the number of works registered was 165—a decrease of one from 1918. Of the 313 processes carried on, 13 were gas liquor, 109 sulphate and muriate of ammonia, and 50 tar.

Ammonia Products, Tar Distilled, and Pitch Produced.

		1919. Tons.	1918. Tons.
Ammonia products (expressed as sulphate)—			
Gas-works	21,300		
Iron-works	10,237		
Shale-works	48,618		
Bone, producer-gas, coke, and carbonizing works	16,590		
		96,745	110,522
Tar distilled*—			
Gas and coke-oven works	160,889		
Other works	99,386		
		260,275	262,771
Pitch produced—			
Gas and coke-oven works	60,423		
Other works	57,541		
		117,964	133,900

* 1 ton = 195 gallons tar.

The number of registered sulphate and muriate of ammonia and gas liquor works remained unchanged at 122. The means used for preventing escape of the noxious gases evolved remained unaltered, and were maintained in satisfactory operation. The production of concentrated liquor was curtailed; and the manufacture of sulphate of ammonia was seriously reduced. The former was due to the cessation of requirement of concentrated liquor for munition purposes, the latter from a smaller recovery of ammonia products in gas-works and iron-works, combined with a considerable fall in the general operations in shale-works. The aggregate falling-off in production was 13,777 tons, or nearly 12¼ p.ct. on the production in 1918. Labour troubles led to interruption in the working of the shale retorts, which directly affected all products made in these works. The future of shale distillation in Scotland is at present very uncertain; and it is possible that the destructive distillation of shale may cease.

The Cost of Smoke.

From the standpoint of money, the importance of smoke abatement is seldom appreciated, though it has been frequently stated, declared Mr. E. P. Roberts, in a paper before the Western Pennsylvania Division of the National Safety Council at Pittsburgh. Smoke abatement practically always results in fuel conservation, usually not less than 10 p.ct., and frequently 20 to 30 p.ct. In addition, smoke is injurious to health, so that working power is reduced, while doctors' and hospital bills are increased. Relative to the economic waste, there have been various reports. A report some years ago by the Chamber of Commerce Committee of Cleveland (of which Mr. Roberts was Chairman), stated that the loss in Cleveland was not less than $12 per head per annum, and not unlikely twice this amount. Calculating the damage per ton of bituminous coal used, the report shows $1·5 per ton; and another report referring to Pittsburgh, $1·25 per ton. Since these reports were issued, some six or seven years ago, the cost of painting houses, &c., has doubled or trebled. It is probably ultra-conservative to state that the damage per ton of bituminous coal in a city having a fair degree of smoke abatement is not less than $1, and that the loss per head is not under $7 or $8 per annum, and perhaps two or three times as much.

Mr. Walter Long has consented to be Chairman of the Motor Fuels Section of the Imperial Motor Transport Council's conference on Oct. 18, when the reports of the Engineering and Denaturation Sub-Committees will be received, and various papers will be contributed. Sir George Beilby, Sir George Goodwin, and Sir John Cadman will be Vice-Chairmen of the conference. There will be an evening session at the Royal Automobile Club, when Prof. H. B. Dixon will lecture and demonstrate certain experiments in relation to power alcohol.

ELECTRICITY SUPPLY MEMORANDA.

MUNICIPAL opinion is now largely concentrated in opposition to the Bill which is to amend the Electricity Supply Act of last year by installing the suspended compulsory clauses as the law of the land, and confirming the money powers which the Government seem to think necessary to prop-up the electricity industry, while other industries must look after their own financing.

Municipal Opposition.

When we see the Association of Municipal Corporations reporting against the revival of the clauses empowering the compulsory purchase of generating stations and transmission lines and the power to establish joint electricity boards, then we may be sure that the concensus of municipal opinion is unfavourable to these particular proposals. The whole force that municipal authority can command in the House of Commons will, we should imagine, now be brought to bear on this matter; and this, combined with industrial antagonism, looks ominous for the Government getting this particular part of their electrical project through. But the Association are favourably disposed to the Government money-lending proposals, and would like to see these maintained. Financial experts and industrial magnates are, however, strongly hostile on all grounds to this use of public money. In the financial state of the nation's money obligations, no fresh commitments ought to be indulged in that can be avoided; precedents in Government money-lending to an industry such as electricity supply (which has not to meet competition from Germany, and does not require support to establish it the same as the dye industry) should not be created; and there are far-sighted men who see that once the Government render aid of this kind, they will find it difficult to refrain from continuing it, if money is hard to get from other sources. The Government will find that, in the past seven or eight months, opinion has vastly altered regarding their original plans, and that the House of Commons will not be so amiably disposed now as they were then to the passing of the proposals that had to be held in abeyance through the opposition that was encountered in the House of Lords.

Difficulty of Financing and Possible Losses.

At the same time, we do not minimize the difficulties of raising capital for such purposes as the extension of electricity supply. It is a real difficulty; and it is equally so to other industries, though offering high rates of interest upon debenture and preference capital. "Electrical Industries" is almost despondent over the matter. It finds the London and South Western Railway abandoning a scheme for the extension of electrification, because the prices for electrical equipment are so "abnormal," which is a fairly universal state. Manufacturers cannot guarantee anything; they are fenced in by uncertainty in the matter of quotations and deliveries. Both have to be subject to unknown developments in circumstances. Our contemporary finds that the electric supply industry "is at present seriously discouraged by the shadow of revived legislation which implies a measure of nationalization." Nationalization of electricity supply would have its path fairly well paved by any Government financing; but to this the industry appears oblivious. All it seems to care for is to get hold of money; and the consequences are of secondary importance. We also read that "many schemes are being formulated and considered; but we have yet to discover that they will find support in the quarters which finally decide the rate of progress—the quarters that supply the capital, and measure the risks before they do so." This is not hopeful thinking and talking; still it is no doubt fully justified. In another quarter, we see that the Richmond (Yorks) Corporation have come to the conclusion that it would be folly to embark on a scheme of electric supply, involving some £25,000, and so have resolved to shelve the matter for twelve months, and then reconsider the position. The "Electrical Review" regards the future of small undertakings as "none too rosy;" and it is of opinion that the risks for them will not be so great under a joint electricity authority as by continuing in isolation. This view is expressed in dealing with the West of England scheme for a Joint Electricity Authority, which will shortly be under the consideration of the Electricity Commissioners. The question of possible future losses, and how they will have to be met, has caused a little disquiet in the minds of some of those who have entered for participation in the scheme. The proposal is that, if there are losses, the authority shall have the power to issue precepts for the deficit on the bodies concerned, proportionately to their representation on the authority. We were under the impression that joint authorities were to adjust their charges to expenditure, so as to make both ends meet, and avoid losses falling upon the ratepayers. We see no reason why joint authorities and municipal undertakings should not be conducted on the lines of sound company enterprise, so that income is sufficient to meet all obligations. But this brings us back to the financing of new schemes. Municipal and Government loans are now in competition with industrial and commercial financing; and the latter are offering high terms in order to obtain the requisite money. They are setting the pace; and at present statutory undertakings will have to keep in close touch to secure capital.

Gas Strike and the Electric Kettle.

The strike of gas workers at Manchester seems to have been a good friend to Simplex Conduits, Ltd., judging from paragraphs, all worded the same, that have appeared in at any rate three electrical papers. The firm appears to have had a big stock of electric kettles they had not disposed of. The paragraph states that when the gas strike broke out on "Friday" [the strike started on Wednesday, July 7, and not on a Friday], the firm named had "their motor lorry loaded-up with first aid in the way of electric kettles, and on the road to the stricken city." This is a very picturesque way of getting a free advertisement. But a still more picturesque, and extremely grotesque, statement is that "by Saturday morning 'Plexim' kettles were finding a ready sale among Mancunians, some of whom are now learning for the first time that, for many purposes, gas is a back number." This is the reason we suppose that gas consumption is increasing very generally, and that many undertakings have a waiting-list for gas appliances. It cannot be the reason why Simplex Conduits had a big stock of electric kettles on hand to meet a sudden demand. Some electrical people and papers go out of their way to make themselves look foolish. However, they are welcome to do so. It adds to the gaiety of the competitor.

Low-Grade Fuels.

The Power Sub-Committee of the Ministry of Reconstruction who helped to advise and mislead the Government (though perhaps inadvertently) through their report which advocated the establishing of super-stations near collieries, did not anticipate that their recommendations would be the subject of so much destructive criticism as they have been; and, when the destructive criticism came, they could not possibly have entertained the belief that the Government would have continued to follow so blindly the course they had taken up as a result of their misdirection. It will be remembered that in the report these words appeared: "By locating either the main or supplementary plants at or near the collieries, much coal that is now wasted or left in the pits could be profitably utilized; and the coal which would otherwise be burned to transport the coal used would also be saved." These words have been made the text for a paper by Mr. A. B. Muirhead, before the West of Scotland Branch of the Association of Mining Engineers; and he ridicules the idea that the fuel now alleged to be wasted is going to be, by the aid of super-stations, the cure for industrial ills, nor is it going to bring the "new earth" promised by politicians appreciably nearer. There is a fine sarcasm underlying his references to articles that have appeared in the Press, obviously written by interested parties, who have systems or apparatus to sell which, so it is stated, will prevent the continued waste of low-grade fuel. What is the character of this low-grade fuel? Mr. Muirhead takes as an illustration a colliery which has some 150 tons of washery duff and silt as low-grade fuel. An analysis shows that this material contains 15·92 p.ct. of moisture, 25·64 p.ct. of volatile matter, 36·83 p.ct. of fixed carbon, and 21·61 p.ct. of ash, and has a calorific value of 8803 B.Th.U. per pound. The theoretical evaporative power of this fuel is 9·07 lbs. from and at 212° Fahr. per pound fired. This assumes a boiler efficiency of 100 p.ct. The high ash content, however, causes frequent clearing of the flues, while excess air admission and reduction of temperature in the grates may reduce the boiler efficiency to 45 p.ct. In the case of a boiler plant worked at a pressure of 100 lbs. per square inch gauge, the steam being raised from feed water at a temperature of 75° Fahr, 3·45 lbs. of steam would be obtained per pound of fuel fired. In the case of a boiler 8 ft. 6 in. diameter by 30 ft. long, with a grate area of 42 sq. ft., and with draught sufficient to burn the fuel at the rate of 25 lbs. per sq. ft. per hour, the fireman would require to shovel 1050 lbs. of this fuel per hour. For this physical effort each boiler would give an evaporation of 3633 lbs. of steam per hour; and the fireman would have to remove 227 lbs. of ash from the grates of each boiler per hour. Thus the hopelessness of trying to run a range of boilers efficiently with the fuel becomes apparent. Various types of fire-bars and forced-draught systems have failed to solve the problem of satisfactorily utilizing the grade of washery duff and silt under consideration. The treatment of the fuel by distillation does not appeal to Mr. Muirhead; and, though often proposed, makers of bye-product recovery plant have so far turned-down the proposal. Mr. Muirhead has some reason for believing that even if the high ash content difficulty were overcome, the capital cost would make the scheme prohibitive.

Problem Attacked the Wrong End.

Mr. Muirhead points out that figures as to cost per unit at consumers' terminals are lacking in the report of the Power Sub-Committee. This neglect is probably due to the difficulty of arriving at capital and working costs, or it may not be good policy to go too deeply into the matter. In any case, it is remarked, the alleged low mine output efficiency, or the "much coal now wasted" at the pits theory, is made a reason for trying to create a monopoly or monopolies in the generation and sale of electricity. Thus it is that, from whatever point of view examination is made, Mr. Muirhead can arrive at no other conclusion than that the Sub-Committee approached the problem from the wrong end; and there are indications that he suspects they were influenced more by the desire to lead the

Government and the industrial public of this country into supporting the setting-up of super-stations in selected areas than to find a reasonable method of using up the fuel now wasted or left in the pits, or to provide the public with a supply of electrical power at a lower cost than has hitherto been possible. The two things are positively antagonistic. The cheaper generation and the cheaper supply are not to be obtained by the introduction of a vast inefficiency at the beginning of operations by the use of inferior fuels. Mr. Muirhead finds it difficult to imagine that it was the intention to secure the lower-grade fuel, and to transport it to the super-station centres, burn it, and get rid of the ashes. This would be a great piece of self-sacrifice. Thus it is we find the belief of Mr. Muirhead lies in this direction: If all our industries including collieries obtained all their power supply from these super-stations, and shut-down their boiler plants entirely, there would be much more low-grade fuel wasted at most collieries than is the case at present; for much of it is now used up, though inefficiently, in the colliery boilers.

The Scheme and the Prediction.

The view of Mr. Muirhead is that the right end at which to attack the problem of cheap power supply is at the collieries, where low-grade fuel is available. But there are important points with which he does not specifically deal. There are the sufficiency of water power for condensation purposes, and the cost of distribution. The former is important. As to the latter, he seems to favour distribution from the collieries to a limited district. His plan is to generate at the collieries surplus power to the full extent of the low-class fuel available—this surplus power to be used for driving local industrial plant, supplying the public lighting, and in some cases operating local tramways, and for the promotion of new industries—such as electric smelting furnaces for iron and steel production. At the colliery he has in mind, he reckons there would be available for day load a surplus of 385 tons of fuel per week. This, he says, is easily capable of giving a surplus of 2200 KW. per hour for an average of sixteen hours per day, or 96 hours per week. This shows a consumption of 4·8 lbs. of the low-grade fuel per KW. hour, which would not be bad working as things go at existing stations, considering the many drawbacks to the use of such fuel under boilers. There comes in the money drawback. He fancies that there are many colliery companies who would not be prepared to face such an expenditure. The easy method of solving this problem is by a Government loan on favourable terms. We sympathize; but Government loans for private enterprise is not an idea that appeals to many as being in the best interests of the country. He also indicates the linking-up of colliery plants as a line of action which would be beneficial in securing the maximum benefit. He believes that it would be possible to deliver to the switchboard power for a continuous process at 0·3d. per unit; for all other power purposes, including heating, 0·75d.; and for lighting 1d. The cost of distribution being confined to a strictly limited area would not be an undue tax on the enterprise. The whole proposal, however, is completely out of harmony with the Government's project of regional concentration of electric power generation. It would also take away from the demand on the district stations some influential and lucrative business, which is not a thing that comes within the compass of the plans of the Ministry of Transport and the Electricity Commissioners. And what of continuity of supply? Would the industries relying on this surplus power have any guarantee that there would be no strike of miners, and that, if there was one, the men in charge of the electrical plant would not be drawn into it?

"Double Gas" and its Use in Gas-Works.

Herr Strache's article in a recent number of a German contemporary is thus abstracted in the current issue of the "Journal of the Society of Chemical Industry:" The author advocates the adoption of a system of primary gasification, followed by steaming—leading to the production of "double gas." The gas has a calorific value of 3330 calories per cb.m., as compared with 5500 calories for ordinary coal gas from the same coal. The amount of coal gas produced per 100 kg. of coal is 33 cb.m.; and the amount of "double gas" 160 cb.m.—the total calorific values being 425,100 calories in the former case (assuming the coke to be used for the production of water gas), and in the latter case 533,400 calories. The minimum calorific values of the gas and tar are given as 60·2 and 8·3 p.ct. of the heat of the coal respectively. The advantages claimed for the process are: Reduced floor space; apparatus always ready for use; reduction in labour; and low initial cost. The yield of bye-products is greater than if coal and water gas are produced separately and then mixed. The tar (sp. gr. 1·042) contains: Water, 33·7 p.ct.; pitch, 18·9; paraffin, 1·5; light oils, 19·4; heavy oils, 24·3; ammonia, 0·91; insoluble in benzol, 1·65; and ash, 0·28.

Continuative Education under the Fisher Act.—Employers of labour should derive substantial assistance from a memorandum which has just been issued by Mrs. M. A. Cloudesley Brereton on the practical initial working of the Education Act of 1918, as it will affect employers through the Continuative Education Clauses. The memorandum is followed by addresses and documents bearing on the subject. The pamphlet is published by Messrs. Knapp, Drewett, & Sons, Ltd., of No. 30, Victoria Street, S.W.; and the price is 2s., post free.

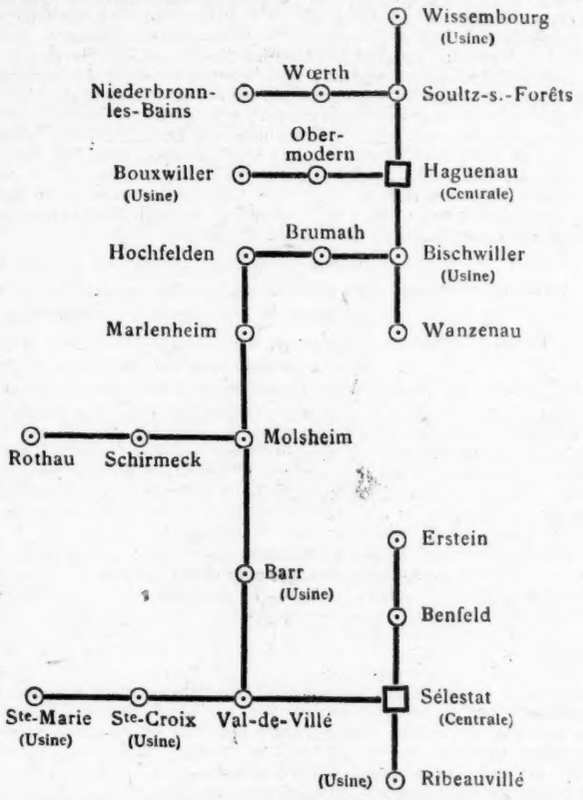
HIGH-PRESSURE GAS DISTRIBUTION IN ALSACE.

By GASTON KERN.

[A Paper read before the Congress of French Learned Societies at Strasbourg.]

In this communication M. Gaston Kern, formerly Manager of the Colmar Gas-Works, has emphasized the importance of the high-pressure system connecting the Alsatian towns of Barr and Mutzig which is claimed by him to represent the first use in Europe of a pressure of several atmospheres in the distribution of gas, and to possess especial interest for the gas industry—demonstrating as it does the advantages of small pipes in the economical supply of gas for domestic and industrial purposes to small villages and hamlets.

He recalls that the idea of generating gas at the pit-head, and of thus avoiding the transport of coal, has been one in the minds of gasmen for a hundred years past, but was long held back by the conviction that a gas of inflammable, explosive, and poisonous properties could be distributed only at a low pressure. The utilization of natural gas in the United States contributed to open a way for highly compressed gas, since it showed the practicability of employing pressures as great as 42 atmospheres in the conveyance of gas over a system of 200 kilometres, as in the case of the supply of Chicago from Greentown.



Scheme of High-Pressure Gas Distribution for the Districts of the Lower Rhine, with Central Stations at Haguenau and Selestat.

(Sélestat to Haguenau . . . . . 78km.)

This last-named achievement served to show the advantages of steel mains over those of cast iron, in respect to weight and non-liability to breakage through subsidence of the ground or in the circumstances to which such pipes are exposed when carried over streams or canals. But while the high-pressure American system showed itself practicable, and brought about the introduction of the fittings required in minimizing leakages, progress in Europe along similar lines was made exceedingly slowly so far as the distribution of gas in rural districts is concerned.

In 1905 a system was laid down at Sainte-Marguerite, in Switzerland (on Lake Constance). The mains are taken up the Rhine Valley as far as the Lichtenstein district, cross the stream, and are distributed in the Austrian Voralberg. But apart from the fact that a rural district is served by this system, there is nothing particularly noteworthy about it. The mains are of cast iron, jointed in the ordinary way. The pressure in the regional gasholders is not more than 2 metres; and generally distribution follows the customary lines. A second system, which attracted considerable attention at the time, was for the supply of Lübeck gas to Travemünd, situated 21·5 kilometres distant. But here also the system was not of the American type—the pressures reaching a maximum of only 3·5 metres. However these two systems led to numerous theoretical and experimental studies of

distribution over a wide area and were succeeded by a number of very different enterprises in Germany and France, but particularly in the suburbs of Paris, Lyon, Berlin, and great industrial and mining districts in many parts of Europe; but all of them at relatively low pressures—of the order of 3·5 metres.

M. Kern's own work has, however, been associated with his native Alsace, and in the first instance with his native town of Colmar. In 1886, he supplied the village of Horbourg with gas from the Colmar works of which he was then Manager. This was an innovation for the district, since Horbourg is 2 kilometres from Colmar, stands at a lower level, and is on the further side of the River Ill. Carrying a conduit across the stone bridge spanning the latter presented difficulties in the use of cast-iron pipes. M. Kern for the first time employed flexible rubber joints, which were found satisfactory provided direct contact with the gas is avoided, since any benzol vapour causes the rubber to perish. On account of this enterprise, M. Kern claims priority in the use in Europe of high pressure in the distribution of gas in rural districts.

The experience thus acquired was found of service when, in 1896, M. Kern took over the management of the Strasbourg Gas-Works, and carried out the establishment of a system of suburban mains, and finally connected Strasbourg to a works at Kehl by a main of 6 kilometres length carried in duplicate over the Rhine bridge, and supplying the Strasbourg system by means of an automatic regulator and a Roots blower, by which the Kehl gas was given a pressure of 1 metre of water. The project proved itself of value to the town in the post-war days, when the municipal works had become too small, and had been further disorganized by the fouling of a holder of 24,000 cb.m. In 1910 M. Kern had proposed to supply the neighbouring towns of Molsheim, Mutzig, and Rosheim with compressed gas from the Strasbourg works; and when this project of conveying the gas from 15 to 20 kilometres was received as a scheme impossible of achievement either technically or financially, he subsequently resigned from his position and devoted himself to a task he regarded as one worthy of crowning his career as an engineer.

The Strasbourg works not being available to him for the supply of the prosperous small towns of the Vosges from Sélestat to Wasselonne, he had recourse to the works at Barr; and in collaboration with Baron von Oechelhäuser, who had inspected the large systems in the United States, he adopted (particularly for reasons of economy) pressures greater than one atmosphere for the purpose of employing pipes of from 80 to 100 mm. in diameter in supplying communes of 1000 to 5000 people scattered over a region of 21 kilometres. This enterprise has fully succeeded, and is in satisfactory technical and commercial operation. It represents the practical accomplishment of the distribution of gas over long distances, in small pipes, at pressures which can be as great as 6 atmospheres. This latter is the pressure which it was seen was required to supply the valley from Bruche to Rothau situated 50 kilometres from the Barr works.

The following are the general practical conclusions drawn by M. Kern from his experience in applying the American system to rural European districts:

(1) Flexible steel pipes with threaded joints and conical junctions possess very great advantages over cast-iron pipes.

(2) The steel pipes should be 10 to 15 metres in length, thus greatly reducing the number of junctions and risk of leakage.

(3) The elasticity of the pipe allows of bending in the cold up to 45°.

(4) The tightness and solidarity of the system are practically perfect.

(5) Laying is done, if required, in lengths of 300 to 400 metres of pipes screwed together on the edge of the trench. The sections are lowered by ropes, and sections can be screwed together even though the trenches are filled with water.

(6) A trench of 50 cm. to 1 metre depth suffices for the protection of the main. Road trenches [ditches] are of service for branch mains. Breaking-up of the road surface is avoided, and the water in the ditch provides an indication of any leakage.

(7) The gas is quickly heated on compression and quickly cools at the outlet of the compressor. This double variation in temperature is attended with more advantages than drawbacks. It is found that the condensation of water vapour, naphthalene, and light hydrocarbons, takes place immediately on compression, so that deposition occurs in the first syphon. All the other syphons of this main of 21 kilometres remain nearly dry; the compressed gas depositing scarcely any condensed products after the first syphon. For this reason, no useful purpose is served in laying the pipes accurately to a given incline, or in providing many syphons. Seven years' experience of the system has fully confirmed this practice.

(8) As regards the quality of the compressed gas, the illuminating power is more strongly affected than is the calorific power, particularly at very high pressures. Fluctuations of pressure over a range 0 to 6 atmospheres have the effect of volatilizing hydrocarbons which have condensed in the first instance—thus restoring the latter periodically to the gas.

(9) A notable feature of the Barr-Mutzig system has been that, in the course of seven years, no naphthalene deposits or stoppages of any kind have been experienced, although the pipes have been laid largely in exposed regions at only 50 cm. depth, and thus subject to severe cold.

(10) The gas is brought to working pressure at the inlet of each regional system by means of American decompressors of very simple construction and thoroughly reliable in use if properly looked after. In conjunction with each decompressor a safety valve is used, the water seal of which is so adjusted that any excessive pressure which might arise during the night at the period of the cessation of domestic consumption can escape by a vertical pipe which is taken to a considerable height in order to render any discharge inoffensive. M. Kern believes that this application of American decompressors has been first carried out by him in Alsace.

(11) Also there have been used, for the first time in Europe, high-pressure reservoirs in place of regional gasholders of the ordinary type. These reservoirs, which have the form of a steam-boiler, may be installed in series after the manner of a battery of boilers at any point on the high-pressure system. They take up little space and may have their use on occasion in works which make gas solely for supply to the immediate district. Inasmuch as their use is not recognized in some comprehensive treatises (such as M. Masse's "Le Gaz"), M. Kern is of opinion that they have not received the notice which their merits deserve.

In conclusion, M. Kern refers to the fact that the section of Schilling's encyclopædic treatise on gas manufacture which deals with the distribution of gas over considerable distances, has been written by him in consequence of the recognition by the present editor, Dr. Bunte, of his (M. Kern's) installation of high-pressure gas in Alsace. At present, it is available only in the original German ["Die Steinkohlengasfernversorgung und ihre Berechnung"], the high cost of printing having prohibited the issue of a French translation.

SIXTY YEARS AGO.

[From the "Journal" for July, 1860.]

Metropolis Gas Bill.—We were not mistaken in assuming that the Metropolis Gas Bill, as amended by the Select Committee, would not be allowed to pass through the House of Commons. The threatened confiscation of the property of the shareholders has roused the indignation and elicited the sympathy of all commercial bodies who hold their property under titles similar to those of the Metropolitan Gas Companies. No fewer than 108 petitions against the Bill have been presented from such bodies; and one petition has been presented from the Chairman and 104 members of the London Stock Exchange, which tells with peculiar force against the principle of deteriorating property invested in the construction of works of utility under parliamentary sanction, which, as they observe, if adopted, is "calculated to shake public confidence, and seriously to affect the credit of the country." These gentlemen have no direct interest in gas companies; but being "extensively engaged in the purchase and sale of shares in joint-stock companies, they consider that the value of all property in such companies would be seriously affected if any precedent should be set for Parliament to reduce the terms on which capital has been laid out." The immediate effect of this threatened confiscation of the property of gas companies has been to completely paralyze the market for the sale of shares in such undertakings, as shown by the broker's list for last week. Scarcely any business was done; and the few transactions that took place were at reduced prices. In the list of "Shares for Sale," are numbered those of the longest-established London companies, whose operations are conducted on the most extensive scale; and shareholders are offering their shares in all directions, but cannot obtain buyers. We are glad to find, from the reception the Bill met with in the House of Commons, when it was brought up in its altered form, that the feeling in the House against the spoliation is not less strong than out of doors.

Attacks upon Private Enterprise.—It is to be hoped that the manufacturing interests of the country must at last be convinced of the necessity for their establishing some permanent supervision over the constant attempts made to secure the extension of the powers of the Central Administration in matters of private enterprise, and some effectual means of resisting the incessant attacks of municipal authorities upon the property invested in incorporated companies. A long series of measures is, in fact, now before the Legislature, which involve the application of principles of so "communistic" a character that, if these measures should be adopted, no company would be safe, nor would its property possess any security whatever. We warn all who possess a stake in the country that the Government and the fashionable socialists of the day are entering upon a course which eventually will result in the confiscation of all private fortunes; and it is precisely because the principles on which the measures we allude to are based seem to us to be of such fearful import, that we feel it to be our duty to protest as distinctly as we can do against their application, and, at the same time, to urge all those whom we possibly can influence to exert all their power to arrest our rulers in their mistaken and awfully mischievous career. It is only by strong union, and by persevering resistance, that the existing system can be checked; and now or never would such union be of effectual value, for the country has not yet advanced so far in its path of democratic spoliation as to be unable to retrace its steps.

THE REVERSIBLE EXPANSION OF REFRACTORY MATERIALS.

A Paper read by Mr. H. J. Hodsman, M.Sc., F.I.C., and Prof. J. W. Cobb, C.B.E., B.Sc., F.I.C., at the Sheffield Meeting of the Society of Glass Technology, November, 1919.

[Reprinted, by permission, from Vol. 3 of the "Transactions of the Society of Glass Technology."]

DURING the discussion at the June meeting of the Institution of Gas Engineers upon the report of the Refractory Materials Research Committee, Mr. A. E. Broadberry mentioned that Prof. Cobb, who had been helping the Committee, had also collaborated with Mr. Hodsman in doing similar work for the Society of Glass Technology, and had added some valuable information to the knowledge which previously existed on the subject of refractories. In his remarks, Prof. Cobb said that what he and Mr. Hodsman had been concerned with had been the measurement of the extent of the reversible expansion and contraction of refractory materials; and some of the results obtained were of considerable interest, as indicating the very strange behaviour of silica. Silica showed the peculiar phenomenon of giving enormous expansion between 500° and 600° C., and almost complete absence of contraction or expansion above this temperature. In view of the importance of the subject to those concerned with silica brick structures, we take the opportunity, by the courtesy of the Society of Glass Technology, of reproducing the paper in which the results of these investigations were set forth.

INTRODUCTION.

The change of volume which occurs on heating is one of the most important physical properties of refractory products, and may at times be decisive in the attainment of success in applications to large-scale practice. The net change may be due to two factors—the one permanent, and usually spoken of as the "after-contraction" or "after-expansion;" the other temporary, solely dependent on temperature, and therefore reversible. Hitherto, the latter has not received the attention which it deserves. In neither the specification of the Institution of Gas Engineers nor that of the Society of Glass Technology has it been possible even to hint at any standards. This is the result of the want of data and experience on the point, due possibly to the lack of convenient methods of measurement. It was to obtain more precise data on thermal expansion and contraction that the apparatus to be described was constructed and put into use in 1914; but owing to the exigencies of the war, the work had to be put on one side and could only be resumed in 1918. The method was adopted largely because it facilitated the detection of changes in the rate of expansion as the temperature was raised.

The methods so far employed by investigators of expansion coefficients are of two kinds—one absolute and generally of a character too elaborate to come readily into general use, and the other relative, involving measurements of expansion as compared with that of a standard material. Several methods of measuring expansion absolutely at high temperatures have been described by Le Chatelier and his collaborators, Coupeau and Damour, Holborn and Wien, and Coppée. Some results obtained with fire-brick by the Coppée method have been reported by Mellor. A brick to which two platinum points are fixed is heated-up in a furnace. The resulting movement of the points can be followed by two telescopes mounted on a bar outside the furnace, and the extent of the movement thus measured.

Expansions relative to porcelain were measured by Le Chatelier up to 1000° by an optical method. Holborn made measurements relative to fused silica, but apparently at comparatively low temperatures only. Boeck has used apparatus resembling the one described below.

Before proceeding to any detailed consideration of the method and results of our investigation, the magnitude of the changes in volume on heating large-scale structures may be roughly calculated and noted. The specifications of the Institution of Gas Engineers require a grade 1 silica brick material, when heated to Seger Cone 12 for two hours, to show no permanent change of length (expansion) greater than 0·75 p.ct. In the experiments to be described, it was found that the mean co-efficient of expansion of such a material previously fired to Cone 9 was 695×10^{-9} from 15° to 1000°. The temporary expansion from 15° to 1350° (Cone 12) may be taken for purposes of illustration as 0·695 p.ct., assuming no further expansion above 1000°. These two expansions are superposed, so that the total expansion with a silica brick complying with the specification, may be 1·44 p.ct., or nearly 1½ ft. per 100 ft. of wall. Where large structures are heated, as in coke-ovens, the necessary allowance for expansion becomes of great importance, and has to be considered carefully in design, erection, and working. An expansion allowance of 3·16 in. per foot for silica material—that is, 1·56 p.ct.—is sometimes made a working rule.

With fire-clay materials, the case differs. Grade 1 products, to satisfy the specification of the Institution of Gas Engineers, must not show a permanent linear change greater than 1 p.ct. on heating for two hours to 1410° (Cone 14); but with clay products this is in general a contraction, and therefore opposite in sense to the reversible thermal expansion. The mean coefficient of expansion found for a fire-clay (Farnley) brick of Grade I., quality from 15° to 1000°, was 509×10^{-8}, or a total reversible expansion of about 0·5 p.ct. up to 1000°. The net change of linear dimensions of such a product on the limit of Grade I., when heated to 1000° to 1400°, may, therefore, be a contraction of about 0·5 p.ct., or 6 in. per 100 ft. It can easily be imagined that a true analysis of these changes in dimension is worthy of considerable attention where it becomes necessary to minimize leakage of gas or liquid, as in retorting, recuperation, and many furnace operations.

Even in apparatus on a relatively small scale, where the absolute magnitude of dimension changes is small, these may still be of vital importance. Some articles must perforce be subjected to drastic temperature influences. Thus, a fresh glass pot is transferred red hot from the pot arch to the glass furnace through cold air, and is subjected to the chilling action of the material charged into it. Considerable strains must result, more in amount as the local shrinkage of the material of the pot is greater, and tending to cause cracking. The degree of disintegration will evidently depend also on the cohesive strength and plasticity of the portions affected at the temperature existing; but this is a matter requiring separate investigation. A minimum and uniform coefficient of expansion over the range of the temperature change is, however, plainly desirable; and this may well be a decisive factor in the selection of materials for glass-pot manufacture. There is a critical temperarure a little below 600°, when many pot-clays in cooling show a sudden contraction, below which it would apparently be very dangerous to allow the pot to cool, even locally, without risk of fracture. In the firing of clay-ware, especially large articles, a knowledge of the ranges where rapid changes of temperature are dangerous, and where permissible is equally desirable; and useful information can, we believe, be obtained from a study of such heating and cooling curves as are given later. Crucibles used for metal melting must withstand sudden and large changes of temperature; and the same applies to gas-retorts and coke-ovens which are charged with cold material. Large coefficients of expansion, and more particularly sharp discontinuities in the expansion curves, are therefore undesirable.

Commercial fire-clays and silica products are particularly prone to abnormalities of expansion; and special attention has been given to the dissection of these.

DESCRIPTION OF APPARATUS.

The furnace consisted of an electrically heated fire-clay tube, 18 in. long, closed at one end by a fire-clay plate. It was wound with nichrome wire, to convey the heating current; and the pitch of the winding was reduced at both ends, so as to compensate for the greater rate of cooling there, and thus ensure a long zone of approximately constant temperature in the tube. The winding was plastered over with fire-clay paste, and the whole placed axially, as in fig. 1, in a shell of tin plate filled with light magnesia.

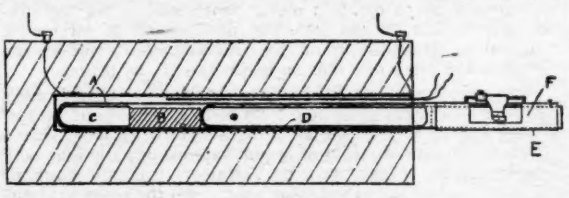


Fig. 1.

The current was regulated by resistances in series and in parallel; 7 amperes at 200 volts being required to maintain 1000° over a considerable range of the furnace. The furnace placed horizontally contained the expansion apparatus proper. This consisted of a tube of fused silica, 3·8 cm. in diameter, 50 cm. in length, with the open end projecting from the furnace, and having attached a brass tube E. The specimen under test, B (usually about 20 cm. long and 2·5 cm. thick), was placed inside the silica tube, together with distance-pieces of silica C and D, of such a length as to bring it into the zone of uniform temperature. To the distance-piece D was cemented another brass tube F, which could slide between guiding screws within the outer brass tube E, and permitted a circulation of air between the two. Both the inner and outer brass tubes carried attached pieces of glass

plate placed in juxtaposition, each bearing a fine scratch. Any relative movement of the scratches could be observed and measured. Relative displacement would be due to the difference of expansion of the specimen and of the length of fused silica tube encircling it. The fused silica distance-pieces, and the portion of the outer silica tube encircling them, would be expected to undergo the same expansion, and so not affect the readings. The distance between the marks on the two glasses was measured at different temperatures by means of a microscope fitted with a micrometer eyepiece. One division of the scale of the micrometer eyepiece corresponded with 1114×10^{-6} mm. Temperatures were observed by means of a platinum-platinum-rodium thermocouple attached to the outer silica glass tube; the junction being about the middle of the specimen *C*. The expansions were, of course, measured relatively to silica glass, which has a low and comparatively constant coefficient of expansion, as shown by the following values obtained by Kaye, which we used in obtaining the absolute expansions of our specimens: 0—30°, 42×10^{-8}; 30—100°, 53×10^{-8}; 100—500°, 58×10^{-8}; 500—900°, 50×10^{-8}; 900—1000°, 80×10^{-8}. Above 1000° abnormalities revealed themselves, which is confirmed by our observations; so that it does not appear possible to extend the method in its present form to temperatures above 1000°.

TESTS OF APPARATUS.

(*a*) *Temperature distribution within the furnace.*—The specimen occupied a zone of the furnace 20 cm. long. A test at 1000° showed that 10 cm. were constant to 5°, 15 cm. to 15°, and that the extreme variation of the whole 20 cm. was 30°. The extreme difference from the average temperature was 15°. The correctness of the temperature measurements is supported by the result obtained for the inversion of silica (α quartz to β-quartz).

(*b*) *Comparison between the temperature recorded and the actual temperature of the specimen.*—The temperature was normally raised at the comparatively slow rate of about 130° per hour, so as to ensure uniformity in the heating of the specimen, and thus bring out the critical temperatures where sudden changes in the rate of expansion occur. It was thought that the temperature indicated by the couple might differ appreciably from the actual temperature of the specimen. Consequently, an additional couple was embedded in a specimen *C* (fire-clay), and a heating and a cooling run taken; the temperatures of the two couples being observed simultaneously by reversals by means of a Pohl's commutator. In the heating experiment, the results showed that the specimen was about 10° cooler than the thermo-junction up to 200°, above which the temperatures were practically identical. The average difference recorded up to 1000° was only 1·5°. In a cooling test from 1000°, the specimen was on the average 14° hotter than the thermocouple outside, with an extreme difference of 22°. While this difference is objectionable, it was not practicable to introduce a couple so as to touch the specimen; and alteration of dimensions to permit this would be undesirable, as facilitating convection currents between the inner and outer tube. The temperature difference is, however, small, and certainly not responsible for the peculiarities observed in the cooling curves obtained from such materials as clays, silica, and siliceous clays. This is clearly indicated by the coincidence of the heating and cooling curves not infrequently observed.

(*c*) *Blank experiment carried out, using a silica glass tube as the sample under test.*—The results were satisfactory. There was very little relative movement between the marks on the two glasses; a negligible decrease in length being indicated at the higher temperatures.

TESTS MADE AND RESULTS OBTAINED.

Samples of typical materials were obtained, shaped as necessary into the form required, and tested by the method described, with results which are detailed below. The results of chemical analyses and the coefficients of expansion are collected in Tables I and II. Unless otherwise stated, the test-pieces were burned to Cone 9, taking 72 hours. The specimens were square prisms about 20 cm. long and about 1·7 cm. edge. Their expansions are shown in figs. 1 to 6 plotted against temperature. One division in a horizontal direction equals 0·1114 mm.

Kaolin.—This material was chosen as representing pure clay, essentially silicate of alumina, $Al_2O_3.2SiO_2.2H_2O$, with the minimum of foreign admixture. The kaolin was sieved through a standard 16-mesh (I.M.M.) sieve, made stiff-plastic with water, moulded, dried, and burned to Cone 06 in 48 hours, or Cone 9 in 72 hours; the approximately corresponding temperatures being 980° and 1280°. The permanent contraction on burning to Cone 06 from the air-dry condition was 1·5 p.ct.; and to Cone 9, 9·3 p.ct. The material (fig. 2) is seen to possess a small coefficient of expansion up to 100°, then a much larger coefficient to 200°, and (what is very important) from 200° to 1000° a remarkably steady coefficent; the cooling curve (not shown) lagging a little behind the heating curve. The actual expansion is rather less than that for alumina.

Alumina.—Fine calcined alumina as prepared commercially from bauxite for the manufacture of aluminium was made-up with the addition of ball clay (10 p.ct.) to allow of binding, mixed with water to a well-damped state, and rammed into the mould. The contraction on burning to Cone 9 was 1 p.ct. It was found (fig. 2) to have a nearly steady coefficient of expansion, increasing slightly with temperature. A small, permanent contraction was observed in the first heating, which may have been due to the friability of the test piece. This view was supported by the observation that the second and third curves were very nearly coincident, and

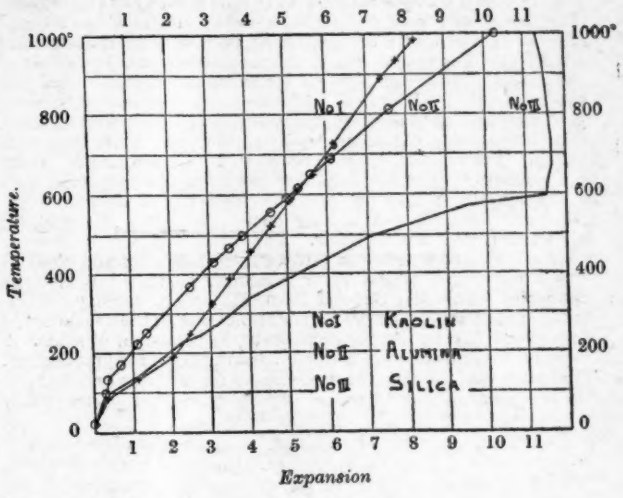


Fig. 2.

showed somewhat greater expansion than was obtained on the first heating of the pencil. The expansion of fused alumina was also studied, using as a test-piece an "Alundum" tube. It showed a uniform coefficient of expansion rather less than that of the calcined alumina (fig. 6). It may be noted at once that the wide variation displayed by different forms of silica (see below) are entirely absent in the case of alumina.

Silica.—A ground quartzite ganister containing 96 p.ct. of SiO_2 was taken for a first study of silica. It was sieved through a 25 mesh (I.M.M. standard) sieve, mixed with 3 p.ct. of burned plaster added as a slip, moulded, dried fairly hard, and slowly heated to Cone 9 over 72 hours. A noticeable feature (fig. 2) was the very large expansion taking place from 550° to 590°; the curve becoming almost parallel to the horizontal axis, and so denoting large and sudden expansion. This, no doubt, corresponds with the inversion of *α-quartz* into *β-quartz* known to occur at 575°. From 590° to 1000°, there was no further increase in length. A very small negative coefficient suggested by the curve obtained was probably that observed in the blank test using fused silica as the test-piece. The second heating curve showed a slightly decreased expansion; a further diminution being seen on the third heating. The cooling curve is very peculiar; for, after running from 1000° to 600° very close to the heating curve, a marked contraction took place during the next 100°, so that in this region of temperature the contraction on cooling was even greater than the expansion on heating. A permanent expansion of 0·12 p.ct. was found after the first heating.

No inversion to *tridymite* up to 1000° could be detected in the experiment by any volume changes above 800°. Other forms of silica require examination, as do some peculiarities in the behaviour of quartz. But what stands out clearly in the results obtained is the large and sudden expansion and contraction between 500° and 600°—just above visible redness, followed by an almost complete constancy of dimensions between 600° and 1000°. It indicates clearly the care which must be exercised in the treatment of a quartzitic silica structure of any kind just about dull redness, if the stresses consequent on volume changes are to be avoided, and also the comparative immunity from damage of this kind which is secured when the silica work is at a good red heat.

Fire-Clay.—This was a more composite material than the previously mentioned samples, but perhaps the most important in

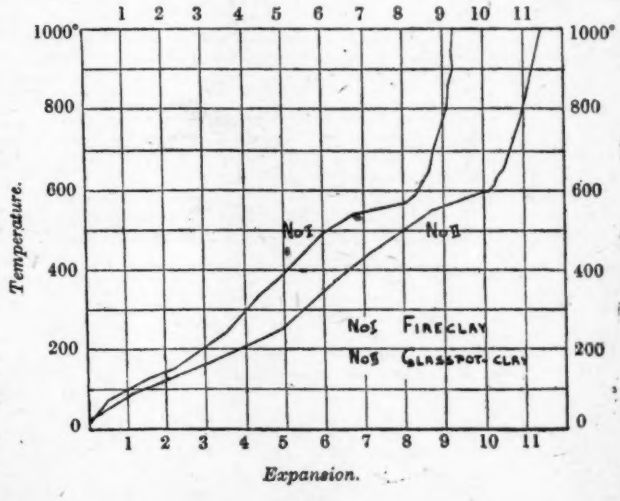


Fig. 3.

practice. A fire-clay from Farnley (Leeds district) was tested first. The test-pieces were burned in a works kiln to Cone 06, and others to Cone 9, with contraction of 1·0 p.ct. from the air-dried condition. The results (fig. 3) obtained bore striking evidence of the great influence exercised on the expansion by free silica present in the clay. There was the same marked expansion between 500° and 600° as was noted with silica; and from 600° to 1000°, though expansion did occur, it was very much smaller than with kaolin. The expansion lay between that of silica and of kaolin, but closer to that of silica than would have been expected from a first consideration of the probable influence of chemical composition. Heating and cooling curves with this material, as with silica, did not coincide. The area enclosed between a heating and a cooling curve (after the first heating and cooling) was within experimental error constant, so that the changes are cyclic. The first differed from succeeding cooling curves. Subsequent heatings showed a slight increase in the coefficient of expansion—that is, just the opposite to the behaviour of silica. A permanent contraction of 0·10 p.ct. accompanied the first heating. It is plain that the remarks made above on the care necessary in the treatment of silica goods will apply equally to this and similar fire-clays.

Clay-Silica Mixture.—Test-pieces were next made-up from a mixture in equal parts by weight of the silica and Farnley fire-clay previously tested. They would represent in composition the so-called siliceous fire-bricks containing about 80 p.ct. silica, now widely used in coke-ovens, retort-settings, and furnaces generally.

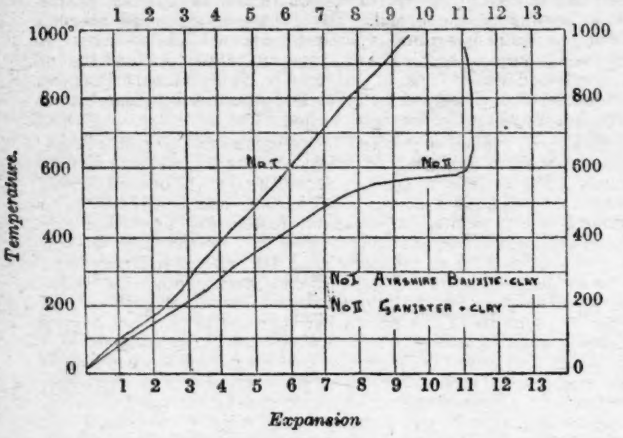


Fig. 4.

Expansion and contraction (fig. 4) were almost exactly the same as those obtained from silica alone, and not intermediate between kaolin and silica. It is suggested that the clay pressed between the grains of silica during moulding had contracted on drying and burning; the pores left being then sufficient to allow of the subsequent expansion of the clay on heating without exerting any expansive thrust. What expansion did occur would then be due to the thrust of opposed silica grains.

A Scottish Fire-Clay (Glasgow District), richer in alumina than the Farnley fire-clay, showed the same sudden expansion between 500° and 1000°—due, presumably, to free silica, but in much less marked degree. And the same may be said of a typical glass-pot mixture (fig. 3), of which the basis was fire-clay from the Halifax district.

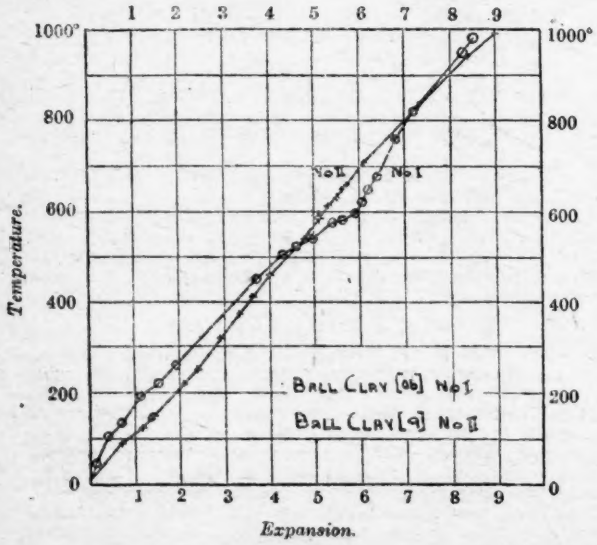


Fig. 5.

Ball-Clay.—An interesting observation was made on the behaviour of test-pieces prepared from a tough and plastic fine-grained Dorsetshire ball-clay. A test-piece which had been previously burned to Cone 06 showed (fig. 5) a flattening of the curve between 500° and 600° which was quite distinct, although less pronounced, than with any typical fire-clay. This test-piece was hard, but porous and unvitrified. Upon repeating with a test-piece previously burned to Cone 9, the flattening had vanished completely; and a straight line curve was obtained almost exactly the same as had previously been obtained from kaolin. This test-piece was close grained, non-porous, and semi-vitrified. This result was very suggestive. It indicated presumably that the action between the fine-grained free silica (quartz) and the clay mass which had occurred during the burning from Cone 06 to Cone 9, whether it resulted in solution, combination, or transformation, was sufficient to suppress the influence of the silica. Compared, too, with other results obtained, it confirms the view that quartz is the form of silica normally present in our clays.

Bauxitic Clay (Ayrshire).—A highly aluminous clay containing more than 40 p.ct. of alumina from Ayrshire, and supplied by Mr. G. V. Wilson, of the Scottish Geological Survey, was tested. The ground clay was mixed with a little water, moulded into shape, dried, and burned to Cone 9.

The heating curve obtained (fig. 4) was simple and continuous, and except for a small inflexion about 200° almost a straight line up to 1000°. In this respect it resembles both kaolin and alumina, which have also simple coefficients; while its expansion curve lies in an intermediate position. The suppression of any discontinuity between 500° and 600° points to the absence of free silica (quartz).*

Magnesia Brick.—This test-piece was prepared from briquettes ready for pressing into commercial magnesia bricks. It contained nearly 10 p.ct. of oxide of iron, and was brown and hard. It showed an approximately straight line expansion curve up to 1000°. This material had the highest coefficient of expansion of any tested over the range 15° to 1000°, although up to 600° the average expansion of silica was nearly the same (fig. 6).

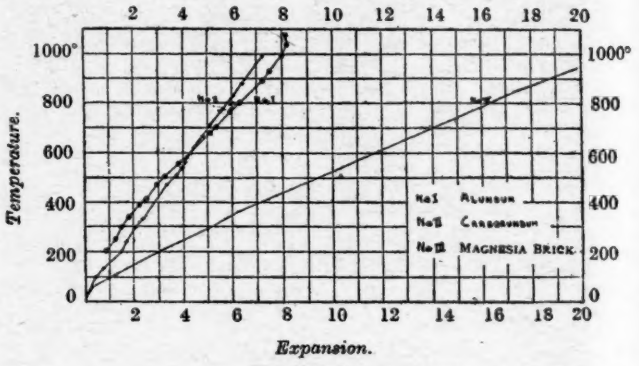


Fig. 6.

Carborundum.—This was the commercial material bonded with a little clay. Its expansion was continuous, and very nearly the same as that of kaolin (fig. 6).

* According to Mr. Wilson, the silica is probably all combined with alumina as kaolinite, and the remainder of the alumina present as a mineral with the composition Al_2O_3,H_2O.

TABLE I.

—	From.	Mean Coefficient of Expansion. Cone 9 Specimens.	Percentage Expansion from 0° to 1060°.
Alumina* (+ 10 p.ct. ball-clay) Second and third heating.	15—1000°	624×10^{-8}	0·62
Silica (quartzose)	15—500°	894×10^{-8}	—
First heating.†	500—600°	2445×10^{-8}	—
	600—1000°	-15×10^{-8}	—
	15—1000°	683×10^{-8}	0·68
Kaolin	15—1000°	531×10^{-8}	0·53
Ball-clay	15—1000°	575×10^{-8}	0·57
Magnesia brick	15—1000°	1274×10^{-8}	1·27
Farnley fire-clay.	15—500°	769×10^{-8}	—
First heating.	500—600°	1275×10^{-8}	—
	600—1000°	183×10^{-8}	—
	15—1000°	583×10^{-8}	0·58
Scotch fire-clay	15—500°	745×10^{-8}	—
	500—600°	1220×10^{-8}	—
	600—1000°	294×10^{-8}	—
	15—1000°	611×10^{-8}	0·61
Carborundum	15—1000°	471×10^{-8}	0·47
Clay + ganister (cone 10)	15—500°	883×10^{-8}	—
	500—600°	2278×10^{-8}	—
	600—1000°	-29×10^{-8}	—
	15—1000°	655×10^{-8}	0 65

* Assuming the influence of the ball-clay to be additive, the calculated coefficient for pure Al_2O_3 becomes 680×10^{-8}. The correction so made is seen to be small.
† The expansions on successive heatings were slightly different (see text).

TABLE II.—*Analysis of the Materials Tested.*

—	Raw kaolin.	Raw ball-clay.	Raw Fire-clay (Farnley)	Calcined alumina + 10 p.ct. of ball-clay.	Magnesia Brick	Silica.	Raw Scottish Fire-clay.	Ayrshire Bauxitic Clay.	Glass Pot Clay.
Hygroscopic moisture . .	0·14	1·24	—	—	—	—	0·12	0·75	—
Loss on ignition	12·78	11·36	9·36	—	—	—	12·78	13·96	—
Silica (SiO_2) . .	46·20	51·62	63·48	5·4	5·80	96·04	51·14	36·65	63·0
Alumina (Al_2O_3)	38·49	32·09	22·39	94·2	1·75	1·42	31·89	43 83	—
Titanium dioxide (TiO_2) . . .	—	—	1·10	—	—	0·05	0 87	3·20	—
Ferric oxide (Fe_2O_3). . .	0·58	1·23	1·33	0·13	9·71	0·27	2·46	0·67	—
Lime (CaO) . .	0 30	0·75	0·70	0·01	2·15	2·0	0·40	0·49	—
Magnesia (MgO)	0 19	0 69	0·52	0·01	79·92	tr.	0·33	0·00	—
Soda (Na_2O) . .	0·81	1·55	0·88	0·01	—	— } 0·22			
Potash (K_2O) .	0·65	0 59	0·47	0·01	—	— }			

SUMMARY.

The results disclose great differences in the beaviour of different refractories when heated up to 1000°. A number of these, including calcined alumina, magnesia brick, carborundum, calcined kaolin, and hard calcined ball-clay, expand regularly over the whole range. These results do not, therefore, suggest the existence of any molecular changes. The behaviour of silica (quartz) is in marked contrast, in that the inversion of α to *β quartz*, accompanied by a very large expansion between 500° and 600°, is succeeded by a range from 600° to 1000° through which the dimensions are practically invariant. Specimens of burnt fire-clay containing free silica reveal the same change, but in a somewhat less marked degree. Some clays resemble more nearly kaolin itself, while others approach in this respect the behaviour of silica. A mixture of half fire-clay and half silica containing approximately 80 p.ct. of silica behaves like silica. Specimens cut from glass-pot fire-clay mixtures were examined, and were not found materially different from the fire-clays. It is evident that pots made from kaolin ball-clay mixtures or from clays containing no free silica (quartz) will be quite different in their behaviour on heating and cooling from pots of which the basis is fire-clay; and also that great care will be necessary in the treatment of pots of the latter description in the range 500° to 600°.

A remarkable feature of the results, not easily accounted for, is the contraction just below 600° on cooling clay and silica, which actually exceeds the corresponding expansion on heating. With silica and fire-clays this is especially marked, and suggests that a rapid cooling of ware or glass pots through the region 600° to 500° must be fraught with quite special risk of cracking. The behaviour of raw clays and of silica in forms other than quartz is under examination. Most refractories examined expanded roughly ½ p.ct. up to 1000°, but magnesia brick more than twice this amount.

Future of the American Gas Industry.

The belief was expressed by Mr. J. C. Dickerman, the Engineer of the State Corporation Commission of Virginia, in a paper before the Southern Gas Association, that the time has come for a marked change in standards of service—especially those relating to the quality of gas and pressure of distribution. It is his view that in the United States the gas of the future must be made almost exclusively from coal, with possibly a little oil used to prevent too wide fluctuations. However, means should be devised to continue using the water-gas plants, so as to avoid the loss of the money invested in them. Some form of combined coal and water gas manufacture would thus become necessary. Inasmuch as without oil a gas of 550 to 600 B.Th.U. cannot be supplied, another standard that will permit the operations suggested must be adopted. Since blue water gas has a heating value of from 300 to 325 B.Th.U., and coal gas of from 650 to 525 B.Th.U. (depending partly upon the quality of the coal, and still more upon the stage to which carbonization is carried), a direct mixture of equal volumes of blue water gas and good coal gas would probably give a heating value of about 475 B.Th.U. But the 800 to 1000 lbs. of coke ordinarily left in the present small plants for each 10,000 c.ft. of coal gas made should produce considerably more than 10,000 c.ft. of water gas; so that a value of 450 B.Th.U.—and possibly as low as 400 B.Th.U.—would be necessary. In arranging works anew, thermal efficiency should be greatly advanced by using the waste heat of the air-blast of the water-gas generator under the coal retorts; and conversely the coke from the retorts should be charged hot to the generator. Vertical retorts set above the water-gas sets would seem to be the logical arrangement. An ideal operation for small and medium sized plants would be gas coal and possibly a small proportion of oil entering; combination retorting and water-gas operation; excess coke or partially carbonized coal used to fire the steam-boiler; and nothing but gas for sale, except possibly some tar. A promising field of study would be whether the capacity of any retort could not be greatly increased, and its life prolonged, by not attempting to distil all the gas, but when three-fourths or so had been driven out draw the coke, still hot, to the water-gas generator, and complete the conversion of coke into gas.

SOME NEGLECTED FACTORS IN INDUSTRIAL STRIFE.

By THOS. NEWTON.

THE waves of industrial unrest which periodically visit, not only the gas industry, but all the industries throughout the country, are due to some factors which have hitherto been neglected by the great majority of employers. Whenever fresh demands are made by workers in a given industry for increases in the rates of pay, a shorter number of working hours, improved rates of pay for overtime, and a greater number of holidays per annum, they are usually and impatiently regarded as so many industrial evils to be overcome. What, however, is not sufficiently taken into consideration is the fact that all such demands are really effects of an altered economic outlook on the part of the workers. In seeking ways and means to overcome and adjust the demands which are so disturbing to industry generally, the fundamental causes are often lost sight of altogether. Yet these same causes will inevitably operate to bring about a crop of fresh demands at the next opportune moment.

The gas industry has had many painful demonstrations of the operations of these causes during the past few years. The effects are patent and concrete; but the causes themselves are of so abstract a character that they almost elude detection. It is therefore scarcely to be wondered at that, in most of the industrial negotiations that have lately been conducted, the negotiators have concentrated on remedying certain economic effects, while ignoring the causes which produced them.

CAUSES OF INDUSTRIAL UNREST.

In tracing the causes which inevitably operate to produce industrial unrest, it should be borne in mind that a new generation of workers has displaced those of the old school. The new type has had certain educational advantages which were denied to the old type; but whether or not these advantages are worth the money which has been spent to procure them is somewhat outside the scope of this article to investigate. What, however, really affects employers more directly are the certainties that the new generation of workers are brimful of new ideas and ideals which they desire to put into practice at the earliest opportunity. They are anxious to improve their "status," which term denotes something far more than improvements in wages and hours.

The old workers, in so far as their opinions could be collectively gauged, were adherents to the "Manchester School" of thought; the new workers are admittedly "Marxian" to a degree. This alteration of viewpoint on the part of the workers is precisely the cause of so much feverish industrial unrest. The old school inculcated the doctrine of buying in the cheapest market and selling in the dearest; the new school does not particularly want to buy and sell at all. One of the tenets of Marxianism is production for use and not for profit; and this, of course, is diametrically opposed to business, as we understand the term to-day. The idea is being sedulously fostered that, according to the philosophy of Marx, a very few hours of labour per day will suffice, or should suffice, to meet the workers' requirements. All private enterprise is discounted; and the nationalization of all industries is advocated. These, then, are but a few of the factors which influence industrial unrest. And the most remarkable feature of all is that the British workman should succumb to this German philosophy which had such a rude shaking during the war.

The spread of elementary education has enabled the workers to take an intelligent interest in all things round them, except the science of economics. Unfortunately, the employing classes disregarded the importance of teaching economics in elementary schools. This lack of foresight is reflected in the impossible demands made by many workers to-day. Either they do not know, or they do not care, whether the industry is in a position to grant them. All the economic education the workers are in possession of, was (and still is) furnished by Trades Unions and kindred associations. Thus, the latter associations are enabled to mould the opinions of the workers to suit their own particular requirements; and thus an "atmosphere" congenial to their purposes is speedily obtained.

From a consideration of the foregoing, it will be readily understood that apt pupils soon attain commanding positions in the labour world among their fellows; and some of more than ordinary receptivity aspire to dominate their erstwhile teachers, while assuming the role of shop stewards. This incessant propaganda can only be so phenomenally successful because there is no effective opposition.

AN EDUCATIONAL REMEDY SUGGESTED.

A policy which simply directs spasmodic attention to the demands of the workers as (and when) they are presented, can yield no satisfactory results in the long run to employers. Something more fundamental and far-reaching is required; and the causes of industrial unrest should receive that consideration which their importance demands. Obvious grievances, where they do exist, should be removed, in order to stabilize industry. The gas industry can congratulate itself in that where grievances have existed in the past it has always removed them as far as lay in its power. It is, however, one thing to deal with legitimate grievances, and another thing entirely to deal with the causes of chronic disaffection. There is little disposition anywhere to

attempt to thwart the laudable efforts of the workers gradually to raise their standard of living. The trouble usually arises through the ill-conceived actions of the young men in a hurry. What is badly needed to-day, not only in the gas industry, but in all industries throughout the kingdom, is some well-directed and concerted educational propaganda having for its object the teaching of a few simple, basic, economic truths. It is a great mistake to ignore the purport and extent of the economic teachings which are to-day received by the workers. And it is equally a great mistake to assume that industrial unrest can be adequately and successfully dealt with in the absence of any reference to such teachings.

Educational propaganda along the lines here suggested would accomplish many things. One great achievement it would certainly accomplish would be to put the other side on the defensive. By hearing both sides of an argument, the workers would be enabled to weigh the *pros* and *cons;* and this would provide the opportunity for reason to prevail. Much spade-work in this connection is required, since about twenty years' arrears remain to be dealt with. The task will be more prosaic than spectacular; but it would prove exceedingly useful, and would yield permanent benefits to both employer and employed. It might well be expected that the impression would at first be slight, but gradually momentum would be gained which would go far to neutralize many pernicious doctrines now being circulated to the detriment of industry. Economic fallacies abound to-day simply because employers have not taken the trouble to refute them. The result is patent to anybody who will observe what is happening in the industrial world.

It may be contended that it is no part of an employer's duty to act in this direction; but this is surely a mistaken view to take, since it is his duty to counteract what is detrimental to his interests, and what is prejudicial to the industrial welfare of the nation. If the gas industry now realizes that it can make no more concessions to labour in existing circumstances, it might be worth while for each undertaking to call together its employees and explain precisely how the present economic situation affects them. It might also indicate what the upshot of a ceaseless industrial agitation is likely to be, and how easily it could ruin the whole community. A meeting of this description held during working hours would probably achieve more lasting good than any number of outside meetings between the representatives of employers and employed. To avoid misunderstanding, it should be stated that no criticism of those who are called upon to negotiate is here intended. Theirs is an onerous task, full of difficulty and responsibility. It is, however, due to the workers that they themselves should hear the version of the management, and that this version should be delivered by the chosen spokesman of the management. Nothing will be lost; but, on the contrary, everything may conceivably be gained by personal contact and appeal, irrespective of whether or not official negotiations are pending.

GAS PRODUCTION FROM VEGETABLE WASTE.

A correspondent of "The Times" says that in Egypt, gas-engines fed by gas from suction producers are extensively used in driving pumps for irrigation purposes. The fuel employed used to be anthracite; but in 1916 its cost became almost prohibitive, and supplies were very short. The Egyptian Government sought the aid of Mr. John Wells, and he worked to discover how the anthracite in the producers could be replaced by waste vegetable matter—such as leaves, cotton stalks, twigs, and branch wood—the apparatus being such as could be managed by unskilled labour.

The main obstacles to be overcome were, on the physical side, the bulkiness of such fuel, and, on the chemical side, its high percentage of ash, its high moisture content, and the tars produced on distillation. For solving the difficulty of bulkiness, special forms of cutting and breaking machines were devised, together with feeding arrangements for the producers designed to prevent wedging or jamming of the fuel, and with means of ensuring continuous delivery and of relieving any block that might occur. The producers were further provided with a non-choking ladder or step-grate, which could be readily cleared of accumulations of ash and clinker by working a poker through a hole in the outer casing. Appliances were also devised for cleaning the gas and removing the tar from it, as must be done if it is to be used successfully in gas-engines. The result was that at the end of 1918 there were some 350 engines in Egypt running on gas produced from vegetable fuel, though a year before there had not been a single one, except in the Fuel Research Station. In some cases new gas-producers had been made in Egypt, in others the original producers had been modified to suit the new fuel.

In the light of the knowledge gained in Egypt, standard forms of the Wells apparatus have been designed with the object of enabling power-users in tropical countries generally to satisfy their needs from the abundance of vegetation growing at their doors. The gas obtained need not necessarily be used in gas-engines. It may also be burned under the boilers of steam-engines, or it may be employed for heating purposes, or even for lighting if suitably enriched. Nor need the heat-value of the vegetable fuel be immediately realized in the form of gas. The gas-producer, provided with appropriate fuel, can be modified to yield charcoal, which, briquetted if necessary, can be stored and used subsequently, as wanted, for heating or for the production of gas. A charcoal converter having a rated capacity of 60 tons of air-dried wood per 24 hours has been in operation in this country for some time past; and tests are being made in the Midlands with a gas-producer designed to give sufficient gas for a 50-H.P. gas-engine. With the latter runs have been made with a fuel consisting solely of town's dustbin refuse.

THE AIR-BRUSH.

Though by no means a new idea, it is only within comparatively recent years that the mechanical brush has been taken-up to any great extent; and the gas industry, in common with many others is rapidly realizing the many applications to which it can be put on the works.

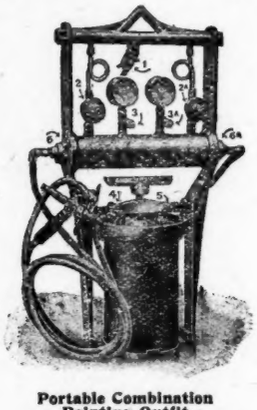
Since its introduction, as with every type of appliance, many improvements on the old idea have successively been made; and attention has been directed by the patentee, Mr. A. Attwood, to the device which is being marketed by the Air-Brush Manufacturing Company, Ltd., of No. 15, Arlington Street, E.C. 1, and known as the "Nimbus" system. The apparatus works on the well-known pistol system, and includes pressure-gauges, clarifiers, air-regulator, and pistol sprayer. Special claims are made by the Company as to the effectiveness of their clarifier.

In regard to the spraying of meters, the Air-Brush Company's apparatus was referred to in the course of an article by Mr. B. R. Parkinson which appeared in the "JOURNAL" for Dec. 3, 1918 [pp. 517-18]. The value of such appliances in this connection is, in view of the publicity given to the report of the Life of Meters Committee of the Institution of Gas Engineers, too well known to need repetition.

Another direction in which the air-brush is capable of useful service to the gas industry is in connection with the spraying of mains. Very satisfactory results have, we understand, been achieved by the "Nimbus" plant in oil-atomizing at a pressure as low as 10 lbs. per inch—results with this apparatus, at the low pressure mentioned, comparing favourably with those obtained by other devices working at a pressure of 80 lbs.

In connection with above-ground plant on gas-works, the mechanical sprayer is rapidly displacing the "man with the brush." For structural work painting—take the case of a gasholder, for instance—a very portable self-contained painting outfit has been devised by the Air-Brush Company, which enables the operator to move the container along with him as the work proceeds. The outfit [shown in the illustration] can be carried on a small trolley

The "Air Brush" Pistol.



Portable Combination Painting Outfit.

or sling; and the operator has full control over both air and paint pressure, and is able to work from any position. The 12 ft. lengths of paint tube and air tube supplied will give scope for 12 ft. radius of work. The advantages of this arrangement are obvious. In the device under notice, should any clogging occur, it is necessary to replace a short piece of pipe only, which can be effected in a few minutes, against the considerable delay and laborious work involved in cleaning the long length of pipe, with its liability to clogging, kinks, &c., in the case where the container is placed on the ground.

For the painting of smaller articles, such as stoves, cookers, meters, &c., the company supply a cabinet, in which arrangements are made for exhausting the fumes away from the operator; while for dealing with larger articles they have introduced a turn-table, the advantages of which are manifest. The table permits the operator to always have in the full light the particular part he is working on.

Irish Association of Gas Managers.—The President and Committee of the Association, after mature consideration, have decided that the annual general meeting, which should be held in August, must be abandoned until such time as the railway troubles are settled and travelling facilities to and from Dublin guaranteed free from uncertainty. They also feel sure the attendance from this cause would be so small as to make the meeting a failure

THE DETERMINATION OF THE THIOCYANATES IN AMMONIACAL LIQUOR AND THE WASTE LIQUOR FROM AMMONIA STILLS.

By JOSEPH A. SHAW, of the Koppers Company, Pittsburgh.

[From the "Journal of Industrial and Engineering Chemistry" of the American Chemical Society.]

To 500 cc. of ammoniacal liquor are added 3 to 5 grams of ferrous sulphate in water solution, and about 100 cc. of a 10 p.ct. sodium hydroxide solution. This is stirred thoroughly, and allowed to stand overnight. It is then filtered with gentle suction, and washed with cold water containing about 30 grams of sodium hydroxide per litre. The long standing in alkaline solution is necessary in order that the insoluble organic matter may be removed thoroughly from the solution. If this is not done, it will continue to settle-out from time to time, and is liable to cause the analyst to doubt as to the sharpness of some of his reactions.

It is necessary to use a special filter for the removal of the sludge from the solution. This filter is made by placing a perforated porcelain plate in a funnel attached to a filter flask, and covering it with a piece of oversized filter paper. When this is drawn into place by the suction, a thin layer of asbestos pulp is poured on the filter, and another piece of filter paper cut considerably under size is placed on top. After a little washing and adjustment, the filter is ready to use.

By this procedure, organic and inorganic material insoluble in alkalies and the sulphides have been removed from the sample, and the cyanides changed to ferrocyanides. The alkaline solution is heated to 60° C., made slightly acid with dilute sulphuric acid, and the ferrocyanides precipitated with a slight excess of a 10 p.ct. ferric chloride solution. After standing a short time, the prussian blue, together with a considerable sludge insoluble in acid solution, is filtered-off on a filter similar to the one used to filter the sulphide sludge. The residue may be used to determine total cyanogen after washing with a 5 p.ct. solution of sulphuric acid containing 5 p.ct. by weight of sodium sulphate.

The filtrate is now made to a definite volume, and one-tenth aliquot parts taken. These are heated to 70° C., and about 15 cc. of 1 : 4 sulphuric acid added, followed by a decided excess of sodium acid sulphite solution, and the thiocyanate precipitated with a hot 10 p.ct. solution of copper sulphate. After standing ten minutes, the CuCNS is filtered-off through a Gooch crucible, the bottom of which is covered with a circle of filter paper, followed by a layer of paper pulp which is in turn partly covered by a small piece of filter paper. Too-long standing previous to filtering is to be avoided, as it increases the tendency of the CuCNS to pass through the filter as a colloid.

The impure CuCNS is washed with hot water of about the same temperature as the original solution which was filtered. Since a little CuCNS sometimes passes through the filter in the colloidal form, the filtrate, if clear, should be removed and discarded as soon as the last of the liquid has been poured through the filter. If a little of the precipitate now passes through the filter upon washing, a quantity of paper pulp may be added to it and the wash water refiltered through an ordinary paper filter, washed with hot water, and combined with the major portion of the CuCNS precipitate.

The residue, consisting chiefly of paper pulp and CuCNS is treated with 25 cc. of *N* sodium hydroxide. A little bromine water is added to oxidize the copper; and after a few minutes, the paper pulp is filtered-off and thoroughly washed with hot water. A little more bromine water is added to the alkaline solution, and digested at the boiling-point for an hour. It is made slightly acid with hydrochloric acid, the bromine boiled off, and the solution taken to dryness. The dry residue is taken up with hot water containing a little HCl and filtered from silica. The sulphur present originally in the CuCNS is the only sulphur now left in the solution; and it is entirely in the form of sulphate. This may now be precipitated with barium chloride, and determined in the usual manner, and the thiocyanate calculated.

Use of Gas in Pin Making.

Writing in the "American Gas Engineering Journal," Mr. Gilbert C. Shadwell, describing the modern method of making pins, says that, after the wire has been cut to the right length, pointed, and the head formed, the pins are removed to a tank-furnace containing a weak alkaline solution, which is made to boil. This tank-furnace can most conveniently be gas heated; and it is certainly a most desirable fuel to use. The object is to thoroughly cleanse the pins (which are usually made of brass) before they are metal-coated. The tank, which ought to be of heavy gauge steel, and galvanized after being welded, should set in the furnace proper, which should be suitably insulated; and two screw oven-heating pipe-burners should be evenly spaced beneath it. After the pins have been cleaned, the basket containing them is lifted out of the tank; and they are set in a special trimming furnace, generally consisting of a copper pan under which is a burner. The pins are put on the pan in layers, alternating with grained tin. The contents of the pan are covered with water, over which a quantity of cleansing material (usually argol) is sprinkled. The pan is then heated by the burners for some time, at the end of which the pins are found to be coated with a thin deposit of tin.

REGULATING THE QUALITY OF WATER GAS.

In an article dealing with the quality of water gas, which appears in the July issue of "The Times" Engineering Supplement, a gas engineer, furnishes evidence of the effect of steam control, and gives particulars of tests with an automatic governor, which is the subject of a patent.

The author says that up to the present it cannot be said that water-gas manufacture has in all cases been carried out in a scientific manner; and one of the main causes of poor quality is the fact that, during the gas-making "run," steam is frequently permitted to pass through the fuel-bed in unrestricted quantities, without any thought as to the theoretical amount which is required. The result is that the fuel is inordinately cooled, and a considerable amount of steam is found to be undecomposed by passing through the bed. Furthermore, this surplus steam combines in part with the hot carbon monoxide in the upper portion of the generator and oxidizes it to carbon dioxide. The introduction of steam-flow meters has done a good deal towards remedying the trouble. It is towards the end of the gas-making period that inerts begin to make their appearance in large quantities; while, in addition, a considerable amount of fuel is wasted in providing excess steam from which no gas is obtained.

The automatic governor (water-gas plant fitted with which he has thoroughly tested) has been designed to reduce, without any attention from the operator, the flow of steam in accordance with the gradual reduction in the temperature of the fuel-bed. In the main steam supply-pipe to the generator is interposed a specially designed throttle, which is operated by a valve-rod connected to the governor. The latter consists of a cast-iron chamber, across the centre of which is stretched a flexible diaphragm. The valve-rod is attached at one end to the centre of the diaphragm, and at the other end to the valve in the steam main. Accordingly, any movement of the diaphragm is communicated to the throttle valve.

Comparative trials were run with and without the steam governor, and with varying flows of steam; the aim being to strike a balance between gas output and carbon dioxide content. In determining a reasonable mean between the two factors, it was necessary to bear in mind that, whereas in the past gas output was of primary importance, to-day constancy of calorific power and low incombustible content are relatively more important. It may be said, in fact, that a reduction in gas output of from 3 to 5 p.ct. is fully justified, provided it is followed by a reduction of 50 p.ct. in the carbon dioxide. It is found, however, that the falling-off in gas yield is extremely small when the steam governor is used, this being mainly due to the fact that without regulation a considerable proportion of the steam passes through the fuel bed undecomposed.

The experiments showed that, operating under the old conditions, the plant in question was being overworked; the output then being, approximately, 15 p.ct. above that for which it was originally designed. Under such conditions, the blue gas contained an average proportion of 8 p.ct. of carbon dioxide. With the same maximum steam flow, but with the governor put into operation, the carbon dioxide content was reduced to 4·8 p.ct., while the gas output dropped by 4·7 p.ct. A comparison of the two series of tests, however, indicated that of the total reduction of gas volume no less than 80 p.ct. was accounted for by carbon dioxide.

As regards the effect on output, the nominal capacity of the plant is 650,000 c.ft. of carburetted water gas per day. With 30 lbs. of steam per minute throughout the run, the daily yield was 720,000 c.ft. of blue gas; while with steam controlled by the governor, and gradually undergoing reduction, the yield was 706,000 c.ft. Perhaps one of the most striking results of operating with properly controlled steam is the very considerable saving that is effected in fuel utilized, both in the generator and for steam-raising.

Calorific Standards in Wisconsin.

Application has been made to the Railroad Commission by the Wisconsin Gas Association for a reduction in the calorific value standards for gas, on the ground of the increasing difficulty in obtaining oil and coal. It is proposed that the present Wisconsin standard of 600 B.Th.U., which was established in 1913, shall be lowered to a monthly average of 520 B.Th.U., with 500 B.Th.U. as the minimum, and 540 B.Th.U. as the maximum. Joining in the application are the thirty gas companies that operate in Wisconsin, who point to grave manufacturing difficulties in justification of the proposed change. The petition protests against the Wisconsin standard of 600 B.Th.U. as being an unreasonable requirement, even when it was first introduced seven years ago. It compares this standard with lower heating values elsewhere—such as Canada, where the standard is 450 B.Th.U.; New England, 528 B.Th.U.; England, with various standards under 500 B.Th.U.; and many States where 565 B.Th.U. has been generally employed. Several of the States are said to be considering much lower standards. The petitioners have no fear of adverse effects on consumers—declaring that at Toronto, where the heating value was gradually reduced from 575 to 475 B.Th.U., the average domestic gas consumer's bill had not increased, and that New England cities had had the same experience.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Free Acid in Sulphate of Ammonia.

SIR,—With reference to the correspondence you have been publishing, Mr. Valon has put the case of acid-free sulphate of ammonia so completely that we did not intend to ask you to publish any further comments from us. It so happens, however, that we have just received striking testimony from Japan as to the evil consequences of the presence of free acid.

We shipped to Japan last March 4000 double bags of sulphate of ammonia; the consignment being made up of the production of sixteen different makers. The percentage of ammonia was in all cases quite good—ranging from about 24⅓ to 25·09 p.ct. Except in the case of two small parcels of about 360 bags combined, the percentage of moisture was also not excessive—ranging from about 1·9 to 3·45 p.ct. The percentage of free acid ranged from 0·20 to 0·75 p.ct.; but the average content of free acid was just under 0·5 p.ct.

The shipment was made by a regular liner, by shipowners who have handled sulphate of ammonia for years, and are thoroughly accustomed to it; and the cargo was put into store by our own agents in Japan. They advise us that the consignment arrived early in May, and that during discharge all the bags were found to be destroyed by the inherent nature of the contents—all the loose stuff being carefully collected and put into straw bags.

We need hardly emphasize the loss which this means. Apart from the total loss of the bags, the buyers in Japan are bound to suffer a heavy loss in weight, which will probably range from 2 to 5 p.ct.

The argument is still sometimes advanced that it does not pay to eliminate the impurities in sulphate of ammonia while there is an ample outlet for the production, because the maker is able to obtain the same price for about 2½ p.ct. of moisture and free acid combined, as he obtained for ammonia. A very simple calculation will show that the loss in the case of the above-mentioned shipment far exceeded the supposed initial gain.

Mr. Valon says that all his local customers, to whom he had previously supplied acid-free sulphate of ammonia, refused to accept delivery of acid sulphate during a temporary breakdown at his works. We have had numerous similar experiences—buyers who have had acid-free sulphate of ammonia refusing to accept delivery of ordinary qualities; in some cases even preferring to buy nitrate of soda at a higher price.

We are convinced that the same tendency is making itself felt in the export market. As soon as the world's supply of nitrogen becomes adequate to the demand, buyers will naturally select the form of nitrogen which is in the best mechanical condition for application to the land, and on the shipments of which they suffer least loss. Acid-free sulphate of ammonia will then be able to command a preference in every market; and inferior qualities will have to find an outlet where they can.

BRITISH SULPHATE OF AMMONIA FEDERATION, LTD.,
T. W. SPEYER, *General Manager.*

30, *Grosvenor Gardens, S.W.*,
July 21, 1920.

Neutral Sulphate of Ammonia.

SIR,—With reference to the letter of Mr. G. S. Pitt, I should be glad if you would allow me to state that we are not manufacturing neutral sulphate of ammonia under the patent mentioned by him, but by the South Metropolitan process (patents Nos. 141,819 and 141,798); the plant having been put in by Messrs. C. & W. Walker, Ltd., of Donnington, Salop.

W. M. VALON.

Gas-Works, Stafford, July 24, 1920.

REGISTER OF PATENTS.

Rotary Retorts.—No. 144,815.

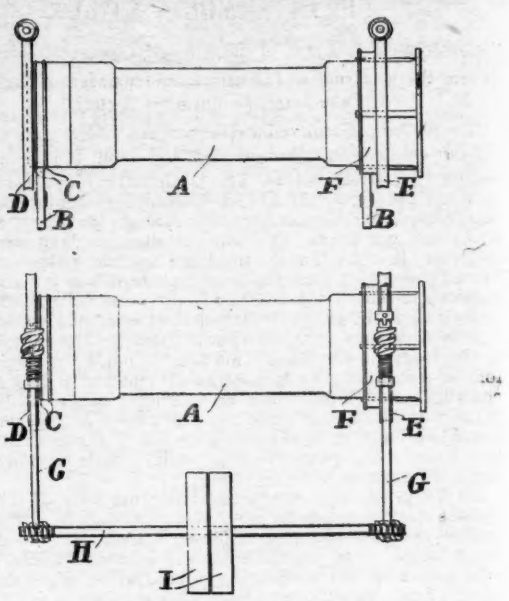
SUMMERS, E. H., of Gloucester, and WHITTARD, E. S., of Rodboro Common, near Stroud.

No. 7052; March 21, 1919.

In order to provide for a more efficient drive, to obtain durability, and to lengthen the life of rotary retorts, the inventor proposes a positive drive, transmitted from a common source of power, at a plurality of axially-separated points (advantageously two points located one at or near each end) in conjunction with a device for taking-up at one end the longitudinal or axial expansion of the retort. The take-up device is characterized by one of its elements being in the form of a flanged gear-wheel carried slidably by the retort but non-rotatable in relation to it, so as to permit the retort body to slide axially within or through the gear-wheel without displacing the latter. Further features of the invention lie in the interposition of a resilient element in the driving mechanism, and in the construction and combination of parts forming the driving mechanism.

An elevation is given illustrating an embodiment of the invention; also a plan showing a countershaft for transmitting power in common to opposite ends of the retort.

The retort is in the nature of a horizontally placed metallic cylinder A, supported at each extremity upon a bearing roller or a plurality of bearing rollers B. At its rear end the retort is furnished with two annular projections C to form a runway for the rollers at that end, so that axial derangement of the retort in relation to the rollers is avoided. At its extreme rear end the retort carries a fixed worm-wheel D. Near the front extremity the retort is encircled by a worm-wheel E adapted to slide axially upon the retort; and it has rearwardly a sleeve-like extension F flanged at its rear edge, with its periphery adapted to bear upon bearing rollers, which, by co-operation with the flange, locates



Summers and Whittard's Rotary Retort.

the worm-wheel; while the front extremity of the retort is adapted under expansion to move axially within the worm-wheel. Each worm-wheel encircling the retort is in mesh with a worm provided upon a shaft G, which also carries a worm-wheel. The worm-wheels upon the two shafts are in mesh with worms provided upon a common shaft parallel with the axis of the retort, and which carries fast-and-loose pulleys by which power may be imparted to it from any source.

Extraction and Recovery of Carbon Bisulphide.—No. 145,099.

COLMAN, H. G., and YEOMAN, E. W., of Arundel Street, Strand, W.C.

No. 21,389; Dec. 20, 1918.

This invention relates to the extraction of carbon bisulphide from coal-tar spirits; also to the recovery of carbon bisulphide in a pure condition from the product obtained in the extraction process.

According to the invention, carbon bisulphide may be rapidly and completely removed at the ordinary temperature from the spirits derived from coal tar by agitation with the aqueous solutions of the disulphides or other polysulphides of the metals of the alkalies or alkaline earths or of ammonium—these being readily obtained by the addition of sulphur, or materials containing free sulphur, to solutions of the monosulphides. When the spirits are suitably agitated, even at atmospheric temperature, with an amount of the di- or poly-sulphide equivalent to the carbon bisulphide contained therein, it has been found that the latter is quickly and quantitatively absorbed, with formation of a solution of the corresponding salt of an acid of the composition H_2CS_4 which may be termed perthiocarbonic acid:

$$Na_2S_2 + CS_2 = Na_2CS_4$$
$$CaS_2 + CS_2 = CaCS_4.$$

The amount of "polysulphide" sulphur required is that necessary to convert the monosulphide employed into the disulphide. If more than this amount of sulphur is present, however, it does not prejudicially affect the removal of the carbon bisulphide, which takes place as before with the production of the perthiocarbonate. But any sulphur over and above the quantity required to produce the disulphide is liberated in the free state, and remains dissolved in the residual spirit or liquid where this is capable of dissolving sulphur, or, if the liquid does not dissolve sulphur, it is precipitated in the free state, usually as crystals.

Thus, for example, if a quantity of sodium trisulphide is employed equivalent to the carbon bisulphide present, the reaction taking place is as follows:

$$Na_2S_3 + CS_2 = Na_2CS_4 + S.$$

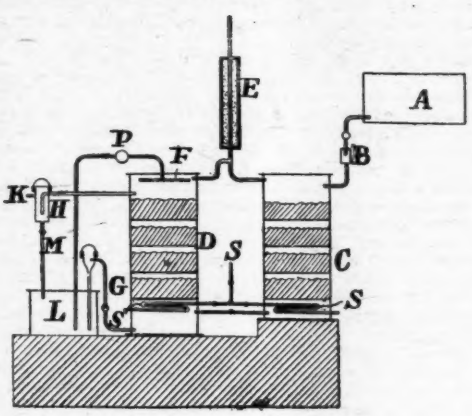
The combination of carbon bisulphide with the polysulphide takes place even at 0° C.; but the rapidity of combination increases with increasing temperature. In order to obtain rapidity of extraction, it is preferable to maintain a temperature of not less than 15° to 20° C.; and it may be allowed to rise to 30° C. without causing material losses of volatile spirits such as benzol, when the extraction is carried out in properly constructed washers as ordinarily employed for washing such spirit with concentrated sulphuric acid and caustic soda for the removal of unsaturated compounds and phenols.

In the preparation of the polysulphide reagents and in their storage, air must be excluded as far as possible, as the polysulphide solutions are readily oxidized by oxygen, forming thiosulphates and acted on by carbonic acid forming carbonates, which have no action on the carbon bisulphide.

The removal of carbon bisulphide from the coal-tar spirits by means of solutions containing disulphides or polysulphides, may be effected

in a number of ways. Thus as the combination of carbon disulphide with the reagent takes place at atmospheric temperature, the washers already in use for liquids such as crude benzol (in which the latter is treated with concentrated sulphuric acid and caustic soda for the removal of unsaturated compounds and phenols) may be employed for the further removal of carbon bisulphide. For this purpose, immediately following on this treatment, or previous to it, the crude benzol may be washed with the requisite amount of the disulphide solution; the removal being complete as soon as the specific gravity ceases to fall, provided that a sufficient quantity of the reagent has been added to combine with the whole of the carbon bisulphide present. It is preferred to carry out the washing in two stages—using first a quantity of the reagent which has been employed in a previous wash, but has not been completely saturated with carbon bisulphide—the saturation being thereby completed. After running off the spent solution, a second charge of fresh reagent is added, more than sufficient in quantity to absorb the remainder of the carbon bisulphide in the charge. This is run off after the completion of the extraction, and is employed for the first wash of the next batch of spirit.

The elimination of the carbon bisulphide as perthiocarbonate by means of polysulphide solutions may also be effected in other forms of apparatus than the mechanical washers at present in use, as, for example, a plant in which the liquid percolates through the apparatus in such manner as to expose it to the action of a large surface of polysulphide solution, or through solid materials which in the presence of water are able to form polysulphide solution.



Colman and Yeoman's Carbon Bisulphide Plant.

Suitable apparatus for carrying out the process in the last-named manner is shown, by way of example in diagrammatic form. It is more particularly applicable where lime and spent oxide are used to produce the required polysulphide.

According to this plan, the coal-tar spirit containing carbon bisulphide flows from the container A through the material containing the free sulphur—such as spent oxide—through which it percolates downwards, dissolving the sulphur, and passing thence to the power part of the vessel D, which is charged with crude sodium monosulphide, calcium monosulphide, or lime, mixed (if necessary to obtain proper percolation) with coarse material, such as coke fragments. Each of the vessels C D is fitted with a closed steam-coil S at the bottom, so that the temperature may be raised if required; any vapours given off at the top of either vessel being retained by a reflux condenser E, and the condensed vapours returned to the vessel C. At the top of D a suitable arrangement F is introduced, whereby, in the first instance, water, and later the perthiocarbonate solution produced from the carbon bisulphide can be sprayed by the pump P over the whole area of the liquid in the vessel, either intermittently or continuously.

The coal-tar spirit in passing through C dissolves the sulphur, the amount of which taken up may be regulated by varying the temperature by means of the steam-coil, and then, in passing upwards through the vessel D containing monosulphides or lime, loses the sulphur forming polysulphide. This, in turn, combines with the carbon bisulphide, forming perthiocarbonate; the latter dissolving in the water or dilute perthiocarbonate solution percolating downwards. The coal-tar spirit freed from carbon bisulphide passes away from the top of D through the seal-pot H and overflow K to the storage tank. Any perthiocarbonate solution carried away with it separates mechanically at the bottom of the seal-pot, and run off periodically to the perthiocarbonate storage tank L by the connection M. The perthiocarbonate solution collects at the bottom of D, and is run off periodically through G into the storage tank L, whence it is again pumped to the top of D. The circulation is continued until the perthiocarbonate solution is sufficiently concentrated, or until the vessels C D require charging with fresh material.

In the case of the use of the monosulphides in D, the temperature necessary is approximately that of the atmosphere; but where lime is employed, the liquid in D must be maintained at a higher temperature. In order to bring about the necessary production of calcium polysulphide from the lime and sulphur, a temperature of 50° to 60° C. is sufficient as regards the production of the polysulphide, and yet not so high as will result in the boiling of the carbon bisulphide, having regard to its admixture with the coal-tar spirit.

Alternatively, the vessel C may be omitted altogether, and the vessel D charged with a mixture of the monosulphides of sodium or calcium, or lime with sulphur (or spent oxide); the spirit containing the carbon bisulphide in that case passing direct from the sight-feed to the bottom of D. Or the vessel C may be omitted and the vessel D charged solely with coarse inert material, over which a solution of polysulphide prepared by any of the methods described and placed in the storage tank L, may be continuously circulated by the pump P through the vessel D, until it is spent. It is then replaced by fresh polysulphide solution.

The solutions of perthiocarbonate obtained in the process may be worked-up to contain upwards of 4 lbs. of the salt per gallon, and may be directly employed as a bactericide, fungicide, or insecticide for agricultural or horticultural purposes. Or, the carbon bisulphide and sulphur in the solutions obtained may be treated for their recovery in a number of ways, six of which are set out in the specification.

Distilling Carbonaceous Material.—No. 145,101.

PERRY, W. P., of Leytonstone, E.

No. 1425; Jan. 20, 1919.

This invention has reference to a continuous process for the separation of volatile products from solid carbonaceous material (such as peat, shale, coal, or the like), and is of the type in which distillation is effected by actual contact of the hot gas with the material to be distilled.

The known apparatus, the patentee remarks, comprises a producer having a feeding-shaft with louvre-like walls, through which a sufficient quantity of the producer gas passes and traverses the incoming fuel to dry and distil it; also a producer having a plurality of vapour outlets therefrom and leading to the condenser, and means for feeding material at the top and removing ash at the bottom. The apparatus is divided into two chambers by a vertical partition having openings or ports and leading from the top to just above the carbon monoxide zone. One chamber contains the material and the other allows vapours and gases to be conducted from the carbon monoxide zone through the openings in the partition and through the material to the outlets, exhauster, and condenser.

The producer is constructed of iron, brick, or reinforced concrete lined with fire-brick or other fireproof material; and between the fireproof material and the wall is a luting of sand. The dimensions and shape of the producer may differ with the nature of the material to be distilled and the rate at which it is to be supplied with air or with air and steam.

From the bottom of the producer upwards, to a distance of several feet, the conditions obtaining in the material in the producer are the counterpart of the interior of a generator of an ordinary gas-producer. At the bottom of the producer (at the point where the downcoming material meets the incoming air and steam) the combustion zone commences, where mainly the combination of oxygen and carbon into carbon dioxide takes place; and this section extends as far upwards as any free oxygen remains to be combined. Next above this point the carbon dioxide in contact with the incandescent fuel is converted into carbon monoxide.

Prepayment Meters.—No. 145,165.

STAPLES, C. W., of Clapham Common, COX, W., of Lavender Hill, and GEORGE GLOVER & CO., LTD., of Chelsea, S.W.

No. 7928; March 29, 1919. No. 23,727; Sept. 26, 1919.

This combined invention relates to prepayment gas-meters of the class furnished with price-changing discs, and is an improvement on the type of prepayment meter having a coin pocket rotatably mounted within a cylindrical casing, and a spring controlled pivoted lever at or near the end adjacent to the axis about which the coin-pocket turns; the lever being moved by the coin when the latter is inserted between the lever and the wall of the cylindrical casing and thereby brought into position for operating the valve mechanism of the meter.

Fig. 1.

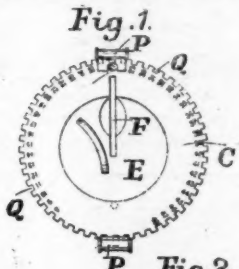


Fig. 2.

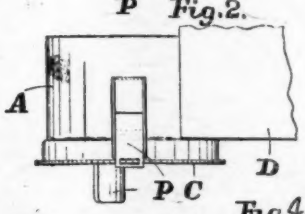


Fig. 3.

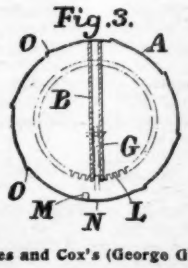
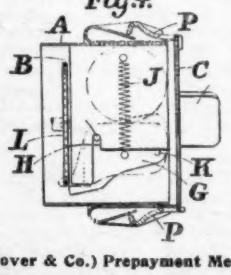


Fig. 4.



Staples and Cox's (George Glover & Co.) Prepayment Meter.

Fig. 1 is a front view of so much of the price-changing mechanism and related parts as is necessary to illustrate the invention. Fig. 2 is

a plan view. Fig. 3 is a transverse section through the coin-pocket and containing box. Fig. 4 is a longitudinal section, showing a coin in the pocket.

A is a cylindrical box which encloses the coin pocket B and carries at its front end the changing or set plate C. D is a portion of the meter casing to which the box is attached. The coin-pocket is fixed to a plate E rotatably mounted in the set plate and operated by means of a handle. When the plate is in its initial position, the coin-pocket is opposite the coin-slot F; so that a coin passed through the slot will enter the pocket, which is open at the top and bottom but closed at the inner end. The floor of the pocket is formed by a lever G, which can turn about a pivot resting in a slot H formed in the lower edge of each side wall of the pocket. The lever is held in place by a spring J, and upward tilting of the front end of the lever is limited by a stop-pin K in the lever coming against the lower edge of the wall of the pocket. When a coin is passed into the pocket, the upper edge of it bears against the inner cyclindrical face of the box, and the lower edge bears on the lever G (the dimensions of the parts being such, in relation to the diameter of the coin, that the coin cannot be forced into the pocket without depressing the lever). The inner lower end of the lever is formed with a tooth which, when the lever is depressed by the coin, is caused to engage with one of the teeth of the quantity wheel L, as indicated by broken lines. The tooth of the lever comes down on the edge of the quantity wheel; and should it not be exactly in line with a space between two teeth of the wheel, it will immediately drop into such space as soon as the pocket is rotated—thus locking the quantity wheel to the pocket. Thereupon the rotation of the pocket carries the quantity wheel round with it. A stop M is provided, to limit the turning movement of the coin-pocket, and in this limiting position the coin is opposite an opening N in the cylindrical body, and it falls out into the money-box provided to receive it. The coin pocket can then be turned back to receive another coin. Notches O are provided in the cylindrical wall of the casing to engage with the edge of the coin, and prevent the backward rotation of the pocket while the coin remains in it.

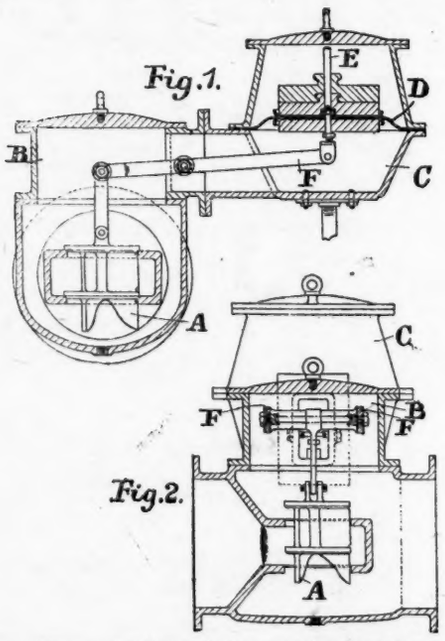
When the plate C is adjusted, it is held in place by spring catches P, adapted, when lowered, to engage with notches Q in the edge of the plate. On lifting the catches out of engagement with the notches, the plate can be turned to any desired new position and locked by lowering the catches again. No tools or spare parts are therefore required to set the meter to deliver any special quantity of gas for each coin inserted. To give the desired quantity the set plate is turned to bring the corresponding number opposite the centre of the upper spring catch which is notched so that a number can be seen. In this way the angle through which the pocket must be turned before the coin is ejected through the slot N is adjusted according to the price of the gas to be delivered.

Governors for Gas-Mains.—No. 145,343.

JAMES MILNE AND SON, LTD., and STANIFORTH, H., of Edinburgh.

No. 28,667; Nov. 19, 1919.

This invention has for its object to provide a gas valve and governor that shall be readily accessible for effecting repairs or renewals.



Milne and Staniforth's Governor for Gas-Mains.

Fig. 1 is a vertical transverse section through the main and valve, and fig. 2 is a vertical section at right angles to fig. 1.

The main is fitted with a double-beat valve A carried by a valve stem which projects into the inspection chamber B above. The chamber is provided with a removable manhole or cover accessible for enabling repairs to be effected, or the valve can be removed through the cover. On one side of the inspection chamber is a chamber C containing a governor of any convenient type—such as a floating bell, piston, or diaphragm. The illustration shows a diaphragm governor D with loading weights adapted to actuate a spindle E connected to one end of a lever F, the other end of which is pivotally connected to the valve stem. The lever passes through a channel or passage establishing communication between the chambers B and C. If desired, the governor chamber C may also be provided with a manhole for enabling ready access to be obtained to the governor, as the parts may be easily withdrawn through the covers, while the lever F is mounted on adjustable centres so as to be capable of easy detachment.

Furnace Retorts.—No. 126,614.

SMITH, C. H., of Short Hills, New Jersey, U.S.A.

No. 9819; April 17, 1919. Convention date, May 9, 1918.

This invention relates to a combined furnace and retort—frequently referred to as a "furnace retort," particularly constructed to effect a partial distillation or carbonization of coal in order to eliminate part of the volatile hydrocarbons contained in the coal and so obtain a uniformly but partially distilled residue.

In the preferred embodiment of the invention, the retort is in the form of a longitudinally extending tubular member closed at each end. It has therein means for mixing and conveying the material that is charged into the retort at one end toward the discharging end of the retort. The retort is heated exteriorly in such a manner that the coal is uniformly but progressively heated as it moves along, being dependent to a certain extent upon the manner in which the charge is mixed and conveyed through the retort.

One of the objects of the invention is to construct the heating means in such a manner that the heat conditions in any transverse portion of the retort are under the control of the operator. The major portion of the furnace retort proper is of masonry, and the mixing and conveying means preferably comprise parallel shafts having paddles thereupon so arranged that one shaft overlaps the paddles on the companion shaft as they are rotated. The shafts and paddles extend through the walls at the ends of the furnace retort, dependent upon which way the construction is considered.

Another object of the invention is to provide a furnace retort construction that will facilitate building and repairing, and that will also permit the inspection of the interior. Yet another object is to provide a construction wherein several parts can be readily assembled into a complete operative whole.

In a furnace for treating coal, it is advantageous in many respects to employ a recuperator for heating the air to support combustion—a device whereby outgoing hot products of combustion or waste gases can be employed to effect the heating of the incoming air to support combustion by an interchange or transference of heat through the walls of the recuperator that serve to separate the passage ways through which the outgoing gases flow from the passage ways through which the incoming air flows.

According to the present invention, a furnace retort is produced provided with a paddle shaft extending longitudinally of, and operating in, a longitudinally extending retort chamber provided with a combustion chamber divided by vertical transversely extending partitions, and by a vertical longitudinally extending partition along the lower portion of the retort so as to provide combustion flues. It also relates to the features of construction above referred to as well as to other features, all of which are fully dealt with in a lengthy specification extending to more than eight pages, accompanied by nine sheets of closely-lettered drawings.

Incandescent Gas-Burners.—No. 144,771.

SCHROEDER, F. W., of Kennington Road, S.E.

No. 6253; March 13, 1919.

This invention relates to incandescent burners of the inverted mantle type, and provided with a nozzle piece and annular mantle holder, as described in patent No. 120,858.

The present invention has for its object to provide means whereby mantle holders that have either inwardly projecting lugs or outwardly extending lugs, or both kinds, may be used with burners of the kind referred to. To this end, the lower or inner member of the nozzle piece is provided with outwardly extending lugs adapted for inter-engagement with inwardly projecting lugs on the mantle holder. The seatings on the lower lugs, on which inner lugs of a mantle bear, are preferably at the same level and in the same radial direction as those on the outer or upper lugs, on which any outer lugs would bear.

The depending lugs on the outer member of the nozzle piece are preferably formed with parts so shaped as to guide in the operation of moving or turning a mantle holder into co-operative engagement with the lugs.

Locking Devices for Gas-Taps.—No. 144,927.

SCHMIDT, O., of Liebertwolkwitz, Germany.

No. 20,950; Aug. 26, 1919.

This invention relates to a locking device which requires separate operation before the tap can be turned from the shut position. It consists in the provision of a spring having a V-shaped bend in which to hold the blade of the tap when the gas is off, and prevent the gas from being turned on until the spring has been deflected. The spring is connected by a clip to the gas-pipe, and is protected by a casing enclosing it.

New Joint-Stock Company.—With a capital of £20,000 in £100 shares, "C.O.M., Ltd.," has been registered to acquire and turn to account any invention relating to the production, treatment, distribution, and use of gasification of fuel and similar substances, &c. The office is at No. 5, Chancery Lane, W.C.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The Gas and Water Provisional Orders Bill was reported, with amendments, and re-committed to a Committee of the Whole House.

The Brighton and Hove Gas Bill and Southend-on-Sea Gas Bill were read a second time.

The Redcar Urban District Council Gas Bill was read the third time, and passed.

The Brighton and Hove Gas Bill was reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

The Examiners reported that the Standing Orders applicable to the Uxbridge and Wycombe District Gas Bill had been complied with; and the Bill was ordered to be read a second time.

The South Metropolitan Gas Bill was read the third time, and passed, with amendments.

The South Suburban Gas Bill was reported, with amendments.

Public Utility Companies (Capital Issues) Act.

A copy was presented of a report upon applications to the Board of Trade under the Public Utility Companies (Capital Issues) Act by the Gloucester Gas Company.

Synthetic Dye Making as a Key Industry.

Mr. SUGDEN asked the President of the Board of Trade if the Government were still of opinion that the development of the synthetic dye-making industry in the United Kingdom was a matter of great importance; and, if so, whether he was now able to make any statement as to the steps he proposed to assist this development.

Sir R. HORNE replied that the experiences of the war made it apparent that the existence of a strong synthetic dye-making industry was a military necessity, and essential to the defence and security of the United Kingdom; and pledges had on several occasions been given that steps would be taken to protect this industry for a time, so as to enable it to be placed on a secure foundation. All the various alternative methods of fostering the industry had been considered, and the opinion of the Government was that assistance could be most effectively given by the prohibition of the importation of synthetic dyestuffs except under licence. An undertaking had already been given to this particular industry that this course would be adopted. Accordingly, proposals to this effect would be embodied in a Bill relating to key industries which would be introduced and proceeded with as soon as possible. In carrying out this policy, it would be the object of the Government to facilitate the working of the trade as much as possible.

GAS REGULATION BILL.

Progress through the House of Lords Committee.

On Monday, the House of Lords, in Committee—with the EARL OF DONOUGHMORE in the chair—considered the Gas Regulation Bill.

Earl GREY moved, in paragraph (*b*) of sub-section 4, of clause 1, after "shall require the undertakers, in the case of alteration in the declared calorific value, to take at their own expense such steps as may be necessary to alter, adjust, or replace the burners," to insert "service-pipes and meters." He said this and subsequent amendments which appeared in his name had been put down at the request of the Association of Local Authorities, who were of opinion that the Bill would inflict hardships in one or two instances upon consumers of gas. The practice at present generally was that service-pipes and meters—service-pipes particularly—were not supplied by the undertaking. But though this was the case, the Bill was promoted for the benefit of the gas undertakers. If the change which was contemplated was carried out, it would not only involve an alteration of the mains, but would also mean that every consumer had to put in new service-pipes and new meters, because the large volume of gas that would be required would necessitate larger meters and larger pipes. If this change was to be made for the benefit of the gas undertakers, the expense of altering the pipes and meters ought not to be allowed to fall on the consumers. He believed the railways also—which he imagined were the largest gas consumers in the country—desired to see this change.

The MARQUESS OF LONDONDERRY said he believed the amendment was unnecessary. An extension of the obligations of the undertakers to replace service-pipes and meters would create an undefined liability upon the undertakers. It would be extremely difficult to determine whether the fact that the meter is too small was due to an alteration in the quality of the gas or to the number of appliances used on the premises. The same kind of consideration would apply in the case of service-pipes. The provisions already in the Bill should be sufficient to ensure that the consumer received an adequate supply of heat units, which was the object of the Bill. The matter would be re-considered; and if he came to the conclusion that there was some substance in the amendment, he would deal with it on the report.

Lord BALFOUR OF BURLEIGH said the only representation made to him was made by an important body, the Federation of Employers; and it was against the amendment. They assured him that the consumers were amply safeguarded without it, and that if it were to be inserted it would go far beyond any recommendation of the Fuel Research Board. He should certainly support the Government in not accepting it.

The amendment was by leave withdrawn.

Where power is exercised outside the local authority in appointing gas referees and examiners, the word "justices" was in all cases altered to "quarter sessions."

In the following section relating to the remuneration and expenses of the gas referees, "each" was inserted instead of "the following;" "three shillings" instead of "fifteen pounds;" "one hundred" was left out; and "sold by them in the preceding year" was inserted in place of "so sold by them."

> Any undertakers with respect to whom an Order under this Act has been made, shall, on or before the first day of April in the following year, pay to a fund (to be called the gas fund) a contribution not being at the rate of more than fifteen pounds for each one hundred million cubic feet of gas so sold by them; and the Treasury may determine that that fund shall be a public fund within the meaning of the Superannuation Act, 1892.

In clause 10, which gives power to the Board of Trade to make Special Orders, the following new paragraph was inserted:

> (*c*) authorize any local authority which may be authorized to supply gas within its area to supply gas outside that area in any district or part thereof not supplied with gas by another authority or company.

The MARQUESS OF LONDONDERRY said this covered the case of a local authority who might acquire a gas company, and not have an Order for supplying gas.

Among the Special Orders the Board may make under this clause, they may "authorize arrangements for the joint working or amalgamation of undertakings;" and to this was added "purchase by agreement," with other consequential alterations. The procedure suggested in regard to such Special Orders was modified.

The MARQUESS OF LONDONDERRY said the following additional subsection (which was agreed to) was needed in order to make it clear that undertakers authorized by Special Orders are to be under the same obligation as if they were authorized by Special Acts.

> For the purposes of any Act of Parliament, whether passed before or after this Act, which refers directly or indirectly to a Special Act conferring powers on gas undertakers, a Special Order under this Act shall be deemed to be a Special Act.

The clauses were passed which make it a penal offence to use unstamped meters; and in future they will have to comply with arrangements made by the Board of Trade.

The provisions which were given in last week's "JOURNAL" referring to the appointment of meter inspectors, and the tests which are to be applied by examination to ascertain their competence for the work, were also passed.

The MARQUESS OF LONDONDERRY said the object was to put applicants for the post of inspector of gas-meters under similar conditions as regards the certificate of competency to those imposed by the Weights and Measures Acts in the case of inspectors of weights and measures. The Board of Trade had been asked by a recent conference of the Association of Gas-Meter Inspectors, Local Authorities, the Institution of Gas Engineers, and the Society of British Gas Industries to insert a clause to this effect.

Other amendments made related to the exclusion of the Metropolitan Borough Councils, and the defraying of expenses in the case of Ireland.

BRIGHTON AND HOVE GAS.

This Bill, which was before the Unopposed Bills Committee of the House of Lords on Thursday last, was sent forward for third reading without discussion.

SOUTH SUBURBAN GAS BILL.

Sir E. CORNWALL presided over a meeting of the Unopposed Bills Committee of the House of Commons on Thursday last, when the South Suburban Gas Bill was considered. It has already passed the House of Lords [see "JOURNAL," May 18, pp. 383, 387].

Mr. BROWNE (Messrs. Dyson, Bell, & Co., Parliamentary Agents) said that the provisions of the Bill were now much fewer than when it was originally introduced, and only related to the user of land for the purpose of manufacturing and storing gas, and to capital. When the Bill was first introduced, it also contained provisions on the lines of those now contained in the Public Bill which was at present before Parliament with regard to an alteration of the basis for charging for gas and an alteration in the standard price as recommended by the Fuel Research Board. At that time, the Public Bill was not in being, and it was not then known in what form the measure, when introduced, would pass. Since then, the Public Bill had been introduced, and it was clear that it would pass in a form which would enable the Board of Trade to deal satisfactorily with the position as regards the matters to which he had referred. With regard to the capital powers under the Bill, the amount of new capital asked for was £500,000.

In reply to Sir E. MOON (the Speaker's Counsel), Mr. Browne said it was not necessary to insert a figure for the rate of interest on the dividend upon the preference stock, as it would be issued under the auction clauses, because the higher the rate of dividend the higher the price obtained; so that it was as broad as it was long.

The CHAIRMAN remarked that there did not seem to be very much in the Bill.

Mr. BROWNE said that was because the Company felt they were treated very well under the Public Bill.

Mr. *Charles Hunt*, the Chairman of the Company, proved the preamble of the Bill, which was ordered to be reported for third reading.

Droitwich Gas Prices.—The Town Council of Droitwich have decided to increase the price of gas from 4s. 5d. to 5s. per 1000 c.ft. The Chairman (Alderman Gabb) said there was no option but to do this, having regard to the cost of administration arising from increased wages and more expensive coal. He added that there had been a loss on the hiring of cookers and meters at pre-war rates. An increase of 50 p.ct. on the charges was agreed to.

MISCELLANEOUS NEWS.

THE GAS-WORKERS' DISPUTES.

Terms of Settlement.

The trouble at the four municipal gas undertakings in the Potteries was settled after a deputation of the men had attended a meeting of the Gas Committee of the Stoke-on-Trent Town Council. At this meeting, the Mayor (Alderman W. E. Robinson) and the Chairman of the Gas Committee (Alderman A. Brockhouse) acted as negotiators for the Corporation. The men placed their case before the Committee; and the whole position was discussed in a friendly and conciliatory spirit. The result was that the deputation agreed to recommend the withdrawal of the strike notices, and that the men should remain at work. The Corporation, on their part, gave an undertaking that they would urge the Federation of Gas Employers to reconsider the whole question.

Members of the Darwen Gas Workers' Union agreed to the terms of settlement under protest, and pressed the Executive not to accept anything less than the full claim without taking a ballot of members concerned.

Correspondence at Plymouth.

An important statement with regard to the attitude of gas workers in the South-West of England to the recent national settlement has just been made by Mr. Dan Hillman (the District Secretary of the Dockers' Union) in reply to a letter addressed to him by Mr. J. H. Ellis (the Chairman of the Plymouth and Stonehouse Gas Light and Coke Company). Mr. Ellis called Mr. Hillman's attention to the fact that, though he had written officially on behalf of the men's delegates accepting the settlement, he was reported to have moved a resolution at a mass meeting of men in Plymouth repudiating the settlement and threatening a withdrawal of labour. Mr. Hillman, in his reply, states that he did not move the resolution. He put the terms of settlement before the men; and they were so dissatisfied that their first resolution was to cease work forthwith. He pointed out to them this was unfair, and that their better course was to try to get another meeting of the Negotiating Committee to re-open the subject. Eventually, this was agreed to, and he got in touch with Mr. Tillett and Mr. O'Grady, of the Dockers' Union. Mr. Tillett suggested it would be wise if the Plymouth men, in conjunction with Bristol and other places where dissatisfaction was felt, would refer the matter to the South-Western Regional Council. At a further meeting, he persuaded the men to adopt this course. Having received resolutions from various undertakings which had been sent to him as Secretary of the workmen's side of the Regional Joint Industrial Council, he came to the conclusion that there was a general desire to repudiate the settlement, so he decided to arrange a workmen's conference, which could have their views sent to the employers' Secretary. "I am still hoping," Mr. Hillman added, "that a bridge will be found for the adjustment of the present position." Mr. Ellis's reply to this was: "We cannot recognize the right or competence of the Regional Council to override a national settlement."

Satisfaction at Oswaldtwistle.

The Oswaldtwistle District Council have expressed appreciation of the workmen in the Gas Department, who, by a large majority, decided to remain at their work during the dissatisfaction respecting the recent wages agreement. This decision, states the Chairman, indicated a sane attitude, which was to be commended. If unofficial strikes were permitted, it would reduce the whole fabric of national and regional settlements to chaos; and the Oswaldtwistle Committee would, in such circumstances, have to withdraw from the Regional Council.

Cheltenham Gas Supply Cut Off.

The gas supply at Cheltenham was cut off on Saturday, following a strike of the employees of the Gas Company. The dispute is said to have arisen out of the refusal of the Company to concede the wages' advance and the overtime and holiday conditions which were settled between the Gas Employers' Federation and the Amalgamated Society of Gas, Municipal, and General Labourers. Upwards of 200 men are concerned in the strike, which comprises all the employees except the clerical staff. The men held a meeting on Saturday, when they refused arbitration, but consented to keep in the fires until the Monday, in hopes of a settlement. The Company assert that their wages bill is nearly five times what it was seven years ago.

Both parties to the dispute remaining obdurate, the remaining employees, who had been allowed by the Union to remain at work to keep the fires in, subsequently ceased operations.

Amended Proposals for Lancashire, Cheshire, and North Wales.

The Regional Council for Lancashire, Cheshire, and North Wales met at Manchester last Thursday to consider the best means of effecting a settlement of the gas-workers' dispute. At the conclusion, it was announced that the employers had made certain amended proposals which the Council had agreed to recommend to the workmen at a meeting at Manchester on Sunday. At this meeting the new terms, though not conceding all that the strikers asked, were recommended by the local officials of the Union for their acceptance, as the best obtainable at present. During a discussion that lasted nearly three hours, one speaker moved a resolution recommending acceptance, and another asked for a ballot to be taken among the gas-workers in all five towns—Manchester, Salford, Stockport, Bury, and Radcliffe—but neither motion was put to the meeting. Finally the audience accepted a suggestion by Mr. J. Williams that the Regional Council (of which he is Chairman) should be given a month in which to evolve a scheme of "zoning" and grading, as a possible way of increasing basic rates of wages. The new concessions offered by the employers affect only holidays and overtime rates, with minor amendment of details.

Apart from wages, the gas-workers originally demanded fourteen days' holiday with pay each year, pay at double rates for Sunday work, and time-and-a-half rates for overtime work. What the employers now offer them was explained by Mr. Williams. Shift workers are to be paid at time-and-a-quarter rates for the first two hours of overtime, and time-and-a-half afterwards, with time-and-a-half for a man working on his recognized day off, unless he is offered an alternative day. The concessions offered for Sunday work are the most important, and were described by Mr. Williams as something he had been working to get for thirty years. With a proviso that Sunday work shall be avoided as far as possible, the employers offer double-time rates to shift workers working during any of the twenty-four hours of Sunday in undertakings which make more than 100 million c.ft. of gas a year. This applies to the undertakings which already pay more than the ordinary time rates for Sunday work. In undertakings of similar size which at present pay ordinary time rates on Sundays, the rates will be increased to time-and-a-half; and these cases will be subject to review by the Sub-Committee on "zoning" and grading. According to Mr. Williams, all the large undertakings in the region will in practice pay the double rates for Sunday work.

Shift workers with twelve months' continuous service are offered seven consecutive days' holiday, with pay for 56 hours, each year; four Bank Holidays or alternative days, with pay—or double pay, if working—and double pay if working on Christmas Day and Good Friday. Mr. Williams explained that men already being paid for Christmas Day and Good Friday when not working will continue to be so paid. After only six months' continuous service, three days holiday will be given, with an extra day for each additional two months' service.

Day workers, whose normal working week consists of 47 hours, are offered the same overtime and Sunday rates as shift workers, apart from lamplighters and watchmen, whose conditions are to have separate consideration. The day workers' holiday will be a week, with pay for 47 hours; and they will share in the terms offered to shift workers for Christmas Day and Good Friday. For work on Bank Holidays their pay will be at time-and-a quarter rates for the first two hours, and time-and-a-half afterwards.

Other clauses in the employers' offer give women the same wages as men for an equal amount of work, agree that existing rates and conditions, where superior to those now offered, shall not be prejudiced, and promise that the new terms, if accepted, shall come into operation on Aug. 1, except for the holiday clauses, which shall take effect as soon as the qualifying period of service is completed. The Regional Council agrees to begin the working of "zoning" and grading immediately, and undertake that any concessions which may result shall date from Aug. 1. The employers reserve the right to withdraw all their proposals in the event of any unauthorized strike taking place, and stipulate that if the gas-workers do not accept the terms, the whole question shall be referred to arbitration.

ACCIDENT AT THE SALFORD GAS-WORKS.

By an unfortunate explosion at the Regent Road Gas-Works of the Salford Corporation, on Monday, six workmen were injured, four of them seriously.

It is stated that the men were employed by a firm of contractors, who were repairing a steel cover in a purifier which was damaged by a fire at the works some weeks ago. They were engaged on riveting work in a box, which is about 30 ft. square, and were standing on a wooden staging. They had been so engaged for an hour-and-a-half, when a flash was observed, and the wooden staging took fire. The men were got out as soon as possible, but not before they had been severely burned. The flames were extinguished by the fire brigade, who were quickly on the spot.

The more seriously hurt were Walter Morris, William Davies, Ernest Biggings, and John Tongue. They had received burning injuries all over the body. George Waterson and William Jones were also burned, but not so severely.

It was officially stated that the cause of the fire was unknown.

SOUTHEND GAS BILL AGREEMENT.

The effect of the agreement come to between the Southend Corporation and the Gas Company (by reason of which the opposition of the Corporation to the Company's Bill was withdrawn) is, briefly, that the Company are prohibited from paying dividends exceeding 7 p.ct. on any preference capital hereafter created, except with the approval of the Board of Trade. The Company are prevented from paying dividends on the ordinary capital already issued in excess of those actually paid in the year 1913, until £30,000 has been placed to the capital redemption fund out of the divisible profits. Subject to the last-mentioned limitation, the Company are permitted to pay dividends at a rate not exceeding 7 p.ct. on their ordinary capital on the assumption that the selling price of gas is 5s. (and 5s. 3d. in respect of certain classes of capital) per 1000 c.ft.; the actual dividend legally payable increasing or decreasing by 2s. 6d. p.ct. in respect of each 1d. by which the price of gas is less than or exceeds 5s. (or 5s. 3d., as the case may be). Thus, except for the operation of the limitation above-mentioned, so long as the price of gas remains at 5s. 8d. per 1000 c.ft., the maximum dividend payable would be 6 p.ct. (or $6\frac{3}{8}$ p.ct., as the case may be). Power is given to the Corporation and the Company at the expiration of five years to apply to the Board of Trade to review the 5s. and 5s. 3d. fixed as the standard price, and, if conditions then justify, to reduce these amounts.

For a period of seven years, the Company shall be under an obligation to charge a rate not less than 1s. 6d. per 1000 c.ft. higher for gas within the Rochford area, now brought within the limits of supply of the Company, than in the borough. The calorific power standard shall be 500 B.Th.U.; and the Company are placed under an obligation within a period of two years to maintain a pressure of 2 in. in their mains and service pipes throughout the borough. Apart from

this, the Company give a parliamentary undertaking within a period of twelve months to lay a main for the purpose of furnishing a satisfactory pressure to the western district of the borough; the cost being estimated at approximately £40,000.

EDINBURGH AND LEITH GAS ACCOUNTS.

A Successful Year.

At a Meeting of the Edinburgh and Leith Gas Commissioners held on Monday, the accounts for the year ended May 15, 1920, were approved and signed. The year began with a deficit in respect of 1917-18 and 1918-19 of £37,042; the expenditure on revenue account amounted to £552,148; and the sum required for annuities, interest, and contributions to the sinking and reserve funds was £122,144—making the total on the debit side £711,334. The income for the twelve months reached the high figure of £716,085 (against £540,434 in 1918-19)—sufficient to meet all charges, wipe out the deficit, and leave a surplus of £4751.

The chief increases in expenditure were for coal, £46,111 (23 p.ct.), and for maintenance of the works and plant, £23,886 (48 p.ct.). The large increase in revenue was attributable to the higher charges for, and greater sale of, gas (£140,127) and to the markedly improved returns from residuals (£44,973). With regard to the latter, coke brought in £23,891 more (33 p.ct), tar, £15,620 (84 p.ct.), and sulphate of ammonia, £5462 (21 p.ct.).

The quantity of gas sold reached the record of 2,196,563,900 c.ft. —187,527,200 c.ft. (9·33 p.ct.) more than during the previous year—towards which public lamps and stairlights contributed 53,272,200 c.ft. It is interesting to note that the number of lamps in use is 6983, as compared with 12,220 in May, 1914.

Annuities of the book-value of £111,122 were redeemed during the year at a cost of £81,554; mortgages amounting to £5900 were extinguished; and the financial position of the undertaking was improved by £135,019—viz.:

Surplus on year 1919-20	£41,793	0	2
Sinking fund contributions and interest	42,559	1	7
Saving on purchase during year of annuities below the value at which they stood in the Commissioners' books	29,568	9	7
General reserve fund increased by	2,771	10	5
Amount written off dead capital (old works)	18,326	14	0
	£135,018	15	9

Working Statistics, &c.

	1919-20.		1918-19.
Gas made per ton of coal and oil equivalent, c.ft.	10,892	..	10,603
Gas sold per ton of coal and oil equivalent, c.ft.	9,812	..	9,721
Average cost of coal and oil equivalent, per ton	21s. 11·99d.	..	19s. 5·87d.
Revenue from residual products per ton of coal and oil equivalent.	14s. 4·11d.	..	11s. 2·19d.
Average net price of gas	4s. 10·84d.	..	3s. 11·60d.
Number of consumers	107,418	..	104,049
Number of gas-cookers on free loan	21,450	..	20,169

FEDERATION OF ENGINEERING INSTITUTIONS.

The current number of the "Engineer" contains a letter on this subject from Mr. Percy Griffith, M.Inst.C.E., a Member of the Institution of Gas Engineers, and formerly Secretary of the Institution of Water-Works Engineers.

Mr. Griffith writes: Now that the Institution of Civil Engineers has accepted the principle of registration as the proper, if not the only, means of securing general compliance with a standard of qualifications adequate to safeguard the interests of the public on the one hand, and to maintain the prestige of the profession on the other, it seems to me that a golden opportunity offers for an effective co-ordination of the work now being carried on by a large number of engineering institutions. At the moment, each of these bodies is struggling to secure for its members special advantages which may not only justify the payment of the annual subscription but also attract new members; and the resulting disadvantages are sufficiently obvious to require no elaborate statement. Briefly, however, they include the following: (*a*) Multiplication of subscriptions, (*b*) overlapping in subjects discussed, and (*c*) distribution of literary matter, models, specimens, and other data required by engineers from time to time among a vast number of centres, located without any consideration of general accessibility.

The difficulty of geographical distribution is being partly met by the formation of local branches in various provincial towns; but the attempt of the London institutions to establish local branches in the Colonies has been finally checked by the establishment of independent institutions in India, Canada, and Australia, representing all branches of the profession, and each providing a scheme of registration which ensures to the members not only public recognition, but security against unfair competition by unqualified men.

These facts will suffice to emphasize the feeling which has been growing rapidly in recent years, and especially during and since the war, that something should be done to co-ordinate the labours of English engineers practising at home; but the difficulties which have arisen in connection with the Civil Engineers (Registration) Bill, promoted this session—but definitely held over for the present—have clearly revealed the impossibility of attaining the object in view so long as the initiative is retained in the hands of one institution. We all recognize the seniority and prestige of the Institution of Civil Engineers; but, unfortunately, we do not quite understand what is meant by the term "civil engineer." Moreover, we all (or nearly all) belong to some other (sectional) institution or society which specializes in the particular branch we are engaged in; and whatever value may attach to our "Inst.C.E." certificate, we still prize quite as highly our certificates proving us to be specialists in our own branch. Registration under the Civil Engineers scheme would, therefore, give little more prestige than we gain from present certificates as "members" or "associate members;" and the only advantage left would be the elimination of the unqualified competitor. It is, however, not certain that we should even secure this, as anyone could practise as an electrical, gas, water, or sanitary engineer, so long as he did not call himself a civil engineer as well.

It is, no doubt, under consideration to provide some means of recognizing the specialist in the registration scheme. But, unfortunately, we have another large and influential institution whose title is almost as vague and ill-defined as that of the senior Institution—namely, the Institution of Mechanical Engineers. Moreover, the interests of these two Institutions are so similar that their very existence side by side entails an element of competition and rivalry which the best intentions of their respective Councils cannot entirely eliminate or overcome. As regards registration, their claims to dominate the situation are nearly equal; and many, no doubt, would, on personal grounds, prefer to trust their fate to the "Mechanicals" rather than to the "Civils." We should, I think, most of us agree in attributing this feeling to the fact that the junior Institution is more "human" than the senior; and possibly in many cases, the term "up-to-date" would be accepted as nearer the truth than the term "human."

Assuming, however, that the two senior Institutions can find some means of acting together in this important matter, we shall be in a position to consider the "registration of engineers" on broad, comprehensive lines; and then we can face the problem involved by the claims of the admittedly sectional institutions. With this in view, it is worth while to realize their specific functions more clearly than has been generally done. For many years past the Society of Engineers, which was established in the year 1854, and therefore follows the Institution of Mechanical Engineers as regards seniority, has been working in the direction of registration for all classes of engineers. But owing to its relatively small membership and the want of sufficiently prominent "personalities," its labours have been unfruitful. Meantime, it has, by a praiseworthy act of self-abnegation, induced the Institution of Municipal and County Engineers and the Institution of Water Engineers to initiate schemes for testing and vouching for the qualifications of their members.

To this extent, at least, we have the materials at hand for framing a comprehensive scheme of registration. The two leading Institutions should, undoubtedly, together form the permanent nucleus of the governing body, and become the Registering Council or authority. But their certificates of competency should be restricted to (*a*) general engineering knowledge, and (*b*) special experience in branches not at present represented by any sectional Institution. In the case of certificates for general engineering knowledge only, registration should not be conceded except in a separate class; and the registration certificate should be clearly differentiated. But it would be certainly preferable that registration should be restricted to those obtaining certificate (*b*); and then the nature of the experience obtained should be stated quite specifically. In all cases where candidates had qualified in some branch represented by an existing Institution, the scheme could provide for registration being granted to anyone holding a certificate issued by the sectional Institution in question—subject only to the examination or other test on the strength of which the certificate was granted being approved by the governing body. To secure the necessary supervision and control, it might easily be arranged that the governing body should have power to nominate representatives on the Sectional Board of Examiners in each case.

Registration certificates would then be issued to all classes of engineers with the particular section or sections in which qualifying certificates had been obtained stated as a supplementary classifying title. The mention of two or even three sections on the certificate would be no serious difficulty. Needless to say, the vague terms "civil engineer" and "mechanical engineer" would disappear into the limbo of a forgotten past.

So much for registration. But I would point out, with all the emphasis at my command, that in negotiating such a scheme as this, the foundation would be laid for a comprehensive co-ordination of the whole profession, the superstructure of which would be comparatively easy of design and erection owing to its manifest advantages. I cannot enlarge on this without unduly encroaching on your space, but it will suffice to indicate summarily some of the possibilities:

1. A central building with a central engineering library (both lending and reference) in Westminster.
2. Provincial engineering centres in the chief cities outside London, with smaller libraries (reference only).
3. Engineering clubs attached to the building in each case, with social functions arranged from time to time.
4. Central meeting halls available for all sections, and possibly sectional headquarters (secretariat) in the same block.
5. Sectional employment bureaux, with sections for juniors or assistants having only general experience.

These are, however, but feeble illustrations of the advantages of co-ordination among professional engineers; and I venture to hope that some of our leading men will seize this opportunity of initiating a movement worthy of our prestige, our ability, and our destiny.

South Suburban Gas Company's Borrowing Powers.—The Public Control Committee of the London County Council report that they have considered an application by the South Suburban Gas Company to the Board of Trade for consent, under the provisions of the Public Utility Companies (Capital Issues) Act, 1920, to the creation and issue by the Company of redeemable debenture stock bearing interest at a rate not exceeding 7 p.ct. to an extent not exceeding one-half of the share capital of the Company for the time being issued and paid up. They have decided to make no representations to the Board on the matter.

BOURNEMOUTH GAS SUPPLY.

At a recent meeting of the Bournemouth Corporation Lighting Committee the Chairman reported that, in accordance with the wish of the Committee, he, with the Mayor, Town Clerk, and Borough Engineer, had an interview with the Manager of the Gas and Water Company (Mr. P. G. G. Moon), and discussed with him the several points which had arisen. Mr. Moon had submitted the following statement proposed to be issued by the Directors of the Company to the consumers.

The Directors of the Bournemouth Gas and Water Company regret to inform their consumers that as from the Midsummer meter-readings the price of gas will be increased by 4d. per 1000 c.ft.—an increase necessitated by the increased railway rates which came into effect in January last; while an increase of 4s. 2d. per ton in the price of coal dated from May 12.

The Directors feel it is desirable that their consumers should be advised of the various factors which have affected and increased the cost of gas, as compared with pre-war conditions.

It is upon the cost of coal that the price of gas must very largely depend. In 1913, the Company paid for seaborne coal delivered to the gas-works at Poole 15s. 9d. per ton. In 1919, the corresponding cost was 55s. 6d. per ton. From May 12, 1920, a further increase of 4s. 2d. per ton had to be paid, making the price 59s. 8d. ton. Seaborne coal is, therefore, nearly four times as dear as before the war. In 1913, the Company paid for Somerset coal delivered into their works by rail 14s. 6d. per ton. To-day the cost is 46s. per ton. Railborne coal is, therefore, three times its pre-war price.

The Government to facilitate transport diverted into other directions the gas coal contracted for by the Company, and replaced it by coal which was most unsuitable for gas making, owing to its low content of volatile matter and high percentage of ash—resulting in the Company having to pay over three times the price for coals containing much less combustible matter.

Gas oil was obtainable before the war in any quantity. The large increase in the consumption of oil fuel, the increased use of oil in place of coal for the propulsion of ships, and the falling off in the supplies of petroleum products in America, have made this distillate (which a few years ago was a bye-product difficult to dispose of) exceedingly scarce, and only very small quantities can be obtained at the present time. In 1913 the price was 2⅜d. per gallon; the present price is 16½d., or over six times the pre-war cost.

The total amount paid by the Company for coal and oil in 1913 was £61,000; in 1919, £174,000.

All materials—such as steel, iron, timber, lead, &c.—are now practically three times their pre-war price; while wages have, of necessity, had to be increased, and are now two-and-one-third times their pre-war amount. In 1913 the total wages paid amounted to £43,502; in 1919, £93,354.

Notwithstanding that the materials required in the manufacture of gas are costing from three to six times as much as in 1913, and that labour is two-and-one-third times as expensive, the price of gas has only increased from 2s. 6d. to 4s. 10d. per 1000 c.ft. This is due to the exercise of every economy, and to the use of manufacturing methods designed to secure in the gas the maximum number of heat units from each ton of coal used. The increase in the price of gas since 1913 is only 93 p.ct.

The rebate of 10s. per ton on coal used for making gas for domestic use did not benefit the revenue of the Company in any way, as the amount received from the coal merchants was handed on to the users of gas for domestic purposes in proportion to the consumption. This allowance has now been withdrawn, as from March 12; but the Company have received sufficient from their coal supplies to allow of a rebate of 4d. per 1000 c.ft. being given to consumers of gas for domestic purposes for the Midsummer quarter, after which the system will come to an end.

The gas industry is, owing to the statutory conditions under which it works, one in which profiteering is impossible. Either the rate of dividend on capital is fixed—in which case any excess of profits beyond what is needed to pay such dividends must be applied to the reduction of the price of gas—or else the undertakings work under the provisions of the sliding-scale, whereby the rate of dividend paid depends upon the price of gas; and any increase in price must be accompanied by a corresponding reduction in dividend. As a consequence, the interests of the consumers and the shareholders are identical, as it is to the advantage of both that gas should be supplied at the lowest price possible.

BRITISH ENGINEERING STANDARDS ASSOCIATION.

Second Annual General Meeting.

The Association held their second annual meeting on Thursday, the 15th inst., at the Institution of Civil Engineers, when the Chairman, Sir Archibald Denny, Bart, presented the report, and reviewed the position—dwelling with special emphasis on the need for further financial support.

Last year, the Chairman showed the vast increase in work of this national organization, both at home and abroad; and this year he was able to chronicle further progress. The Association are rendering an indispensable service to British trade at home in co-ordinating standards, promoting efficiency, and eliminating waste, and are also doing much to push British trade abroad. It is therefore regrettable that, even after twenty years of useful work, the engineering industry of the country is only now slowly putting the Association in a position adequately to cope with the increasing demands made upon it.

The Chairman mentioned that, since the last annual meeting, 27 British standard specifications had been issued, and some 70 are under revision. The new work the Association have in hand includes the drafting of British standard specifications for various chemical products, steel wire ropes, &c.

Probably the largest development during the year under review has been in connection with the electrical industry, for which some 45 British standard specifications for electrical apparatus are in course of preparation.

That an organization such as this should close its financial year with a deficit of £1100 is a matter which, no doubt, will be dealt with by the industry at once, and generously. A number of leading firms who are perhaps more closely in touch than others with the actual work carried out by the Association, have increased their support by, in many cases, doubling their subscriptions.

It is interesting to see that the engineering public make increased use of the British standard specifications; for the Chairman stated that 31,000 of the specifications had been sold (almost all in this country), against about 3000 in pre-war years.

ROYAL SANITARY INSTITUTE HEALTH EXHIBITION.

Under the auspices of the Royal Sanitary Institute, who held their thirty-first congress at the University of Birmingham last week, a Health Exhibition, which will remain open till next Monday, was inaugurated by the Lord Mayor (Alderman W. A. Cadbury). The exhibition, which fills Bingley Hall, has relation, for the most part, to appliances for housing and general sanitation—and, indeed, to all matters relating to health and physical welfare. It follows, therefore, that public attention is directed to the claims of modern gas equipment from the hygienic and economic standpoint; and there are a few stands upon which representative displays are made.

Prominent is an artistic and comprehensive exhibit by the City of Birmingham Gas Department (arranged by Mr. R. J. Rogers, the Superintendent of the Fittings Department), which is awarded the silver medal of the Sanitary Institute. It deals primarily with gas cooking and heating appliances, many of which strikingly emphasize their hygienic value; and upon this subject Mr. Rogers will deliver a couple of lectures at the exhibition. The department show an up-to-date arrangement whereby the old-fashioned kitchen range may be entirely dispensed with, and its place taken by gas apparatus, consisting of cooking-stove, gas-fire, and hot-water circulator. The completeness of the installation is indicated by the provision it makes for hot water for a bath which is shown on the stand; and a geyser ready for use is also exhibited. Architects and builders find a good deal to interest them in a full size 9 in. by 3 in. gas-fire flue built in a 4½ in. wall.

The bronze medal of the Institute is awarded to Messrs. J. J. Chettle and Co., of London, for their "Stimex" gas-stove (with outside burners) and ring. There are other displays by the Hurry Company, of Birmingham, with gas-heated equipment for supplying hot water expeditiously; and the London Warming and Ventilating Company, who show a one-ring gas-cooker.

THE SMOKE EVIL.

Strong Plea for the Use of Gas.

Some powerful arguments for the use of gas in place of raw coal for heating and cooking purposes were advanced last week in Manchester, before Lord Newton and his colleagues, who have been charged to make inquiries concerning the deleterious effects of smoke on health and life and public buildings.

The Chairman of the Manchester Corporation Gas Committee (Alderman William Kay, ex-Lord Mayor), said he thought the time had come for legislative prohibition of the open-fire grate, though it was almost treason to say such a thing in Lancashire. Still it was necessary to do something to conserve our coal stores, as well as to purify the air. In his opinion, the domestic chimney was a greater sinner in the cause of polluted air than the tall factory chimney. He knew this from experience; for in his youth he used to be at his father's brewery at 5.30 a.m. At that hour he could see Bowden Downs, eight miles away, quite clearly; but an hour later, when the house chimneys began to tell their tale, it was as if a cloud had come over the scene, and the distant hills were obscured. He was glad that the old prejudice against the gas-fire was passing, and that the doctors no longer inveighed against it. He told the Commission how much gas-cookers were in use in the Manchester district, and suggested that in the housing scheme now going on an effort should be made to restrict the use of open-fire grates.

Many testimonials were given as to the evil effects of noxious fumes from chemical works, as well as smoke; and an earnest appeal was made to the Commissioners to impress upon the Government the absolute need of quick and effective action, with a view to suppress the smoke evil, and, as a means to this end, to encourage the more general use of gas.

An Unexpected Rebate for Leeds Consumers.—The Leeds Corporation Gas Committee last week decided to give the consumers an unexpected rebate. In January, following the announcement that the Coal Controller had allowed a rebate of 10s. per ton in respect of coal consumed in gas and electricity works, the Gas Committee deducted 8d. per 1000 c.ft. from their charges in the first quarter of the year. The rebate of 10s. was cancelled as from May 12; and the Committee withdrew their allowance. Later it was discovered that a sum of between £9000 and £10,000 remained in the hands of the Committee as the balance of the Coal Controller's rebate; and this had to be distributed among the consumers. The Committee agreed to allow a reduction of 8d. per 1000 c.ft. to consumers with automatic meters up to May 12, and to make a rebate of 5d. per 1000 c.ft. in respect of the June quarter to those who have quarterly accounts. Thus, instead of paying 4s. 10d. per 1000 c.ft. they will pay at the rate of 4s. 5d.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *July* 26.

The market for pitch is firm, and values continue to advance; the price to-day for next season's delivery being not below 195s. per ton, net, f.o.b. makers' works. Creosote is steady at about 1s. 3d. per gallon, net and naked. Pure benzol and pure toluol are about 3s. 9d. per gallon, 95-160 solvent naphtha about 3s. 6d. per gallon. Pyridine bases are quoted from 17s. 6d. to 20s. per gallon. Naphthalenes are in strong demand at advancing values.

Sulphate of Ammonia: Available supplies are readily taken up. The price for August delivery to dealers is £23 10s. per ton for 24¾ p.ct.

Tar Products in the Provinces.

July 26.

The average values for gas-works products during the week were: Gas-works coal tar, 110s. to 115s. Pitch, East Coast, 175s. to 180s. per ton f.a.s.; West Coast—Manchester, 175s. to 180s.; Liverpool, 175s. to 180s.; Clyde, 175s. to 180s. nominal. Benzol 90 p.ct. North, 2s. 6d. to 2s. 7d.; crude 65 p.ct. at 120° C., 1s. 8d. to 1s. 9d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 4d. to 2s. 6d. Toluol, naked, North, 2s. 6d. to 2s. 7d. nominal. Coal tar crude naphtha in bulk, North, 11½d. to 1s. Solvent naphtha, naked, North, 3s. 1d. to 3s. 3d. Heavy naphtha, North, 3s. 4d. to 3s. 6d. Creosote, in bulk, North, liquid, 1s. to 1s. 0¼d.; salty, 11½d. to 1s. Heavy oils, in bulk, North, 1s. to 1s. 0¼d. Carbolic acid, 60 p.ct., 4s. to 4s. 1d. Naphthalene, £40; salts, £9 to £9 10s., bags included. Anthracene, "A" quality, 1s. per minimum 40 p.ct.; "B" quality, nominal.

Manchester District Tar Prices.

The average price realized for the sale of tar, on the sliding scale, for the month of June was £6 19s. 3·90d.

FROM A MARKET CORRESPONDENT.

Tar Products.

The tone generally continues very good. There is a growing scarcity in some lines, and sellers are difficult to find. This is probably due to a considerable decline in output. There are heavy inquiries for pitch—particularly for shipment—and values are well maintained. Indeed, in some parts, increased prices are being asked and obtained. It is reported that £10 has been paid in South Wales; and £9 10s. is notified from Manchester. The prices are really difficult to fix at the moment; but certainly £9 is the lowest. Solvent naphtha remains steady, and but little business is passing; the demand from the rubber manufacturing trade having fallen off lately. There is a very heavy demand for naphthalene; and supplies are quite insufficient to meet it. The value of refined flake is reported as over £50; and crudes may be anything between £14 and £22. It is pretty obvious that outputs are quite inadequate in view of the continued demand from the fire-lighter and dye industries. Creosote and cresylic acid are firm at late rates. Carbolic acid is not so plentiful at the moment. There seems to be a falling-off in production; prices, however, are unchanged. Some poor quality crystal is on the market; and this is probably material on re-sale by Japanese holders. Intermediate products are without much change, though there is a slight improvement in the matter of export licences. Aniline oil and salts are without change in price; but technical salicylic acid is a shade cheaper.

The range of quotations is as follows:

Benzol: 90% London 2s. 5d. to 2s. 7d., North 2s. 4d. to 2s. 6d.; 50-90% 2s. 3d. to 2s. 4d. London, 2s. 2d. to 2s. 3d. North; crude 60-65%, 1s. 6d. to 1s. 8d.; pure, 4s. per gallon naked.

Crude Tar: London, 87s. 6d. to 90s.; Midlands, 85s. to 87s. 6d.; North, 85s. to 90s. per ton *ex* works. Refined tar, 65s. per barrel (free) on rail.

Pitch: London, 195s. per ton; East Coast, 190s. to 195s. per ton; West Coast, 185s. to 195s., with Manchester 190s. per ton, and Glasgow 190s. per ton; South Wales, 200s. per ton.

Solvent Naphtha: London, 3s. 4d. Provinces average 3s. 3d. per gallon.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 3s. 6d. per gallon.

Naphthalene: Refined, £50 per ton nominal; inferior, £35; crude, £14 to £22, according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 4s.

Creosote: London, 1s. 1¾d. to 1s. 2¼d.; North, 1s. 1¼d.; heavy oil, 10¼d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Pyridine: 20s. to 25s. per gallon.

Aniline Oil: 1s. 9d. to 1s. 10d. per lb., drums extra.

Aniline Salts: 2s. to 2s. 2d. per lb.

Cresylic Acid: 95%, 4s. 9d. to 5s. 3d.; 97-99%, 5s. 6d. to 5s. 9d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 4s. 6d. per gallon; crystals 40%, 1s. 3d. to 1s. 4d. per lb. (nominal).

Salicylic Acid: Technical, 2s. 9d. to 3s.; B.P., 3s. 6d. per lb.

Xylol: Pure, 6s.; commercial, 4s. 9d. per gallon.

Sulphate of Ammonia.

The home trade is firm on a heavy demand from Ireland; and the export trade continues steady, though prices are not quite so high as a few weeks ago. Japan, though still the largest buyer on the first six months of this year, is taking less as time goes on. The demand in Japan is obviously falling off, as importers there are trying to dispose of surplus stocks at a profit by taking advantage of the Java market for this fertilizer for the sugar crop, resulting from Java's difficulty in obtaining supplies from Great Britain. There are other disappointing factors in the export situation.

Main's "Housing" Cookers.

HOUSES are building slowly yet surely, and the Government Department concerned with the nation's need in this respect has made its selection of cookers suitable for present and future schemes.

The Main "Surrey" Cooker on stand was an early choice, and this popular Stove has already been supplied in large numbers to those districts fortunate enough to have schemes certificated by Government.

The design, dimensions, finish, and price of the "Surrey" Cooker make it ideal in every respect.

May we send you our "Housing Problems" booklet. It will assist you with the Housing Schemes in your District.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N.18; Gothic Ironworks, FALKIRK; and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

Stourbridge Gas Department.

Mr. Charles H. Webb, M.Sc., the Gas Engineer and Manager of the Stourbridge Borough Council, in the course of his fifteenth annual report upon the working of the Gas Department, states that for the twelve months ended March 31 there was an increase in the sale of gas of over 29 million c.ft., or 11·3 p.ct., over the previous year. The total receipts were more by £12,437. Higher cost of coal, labour, and materials were responsible for an increase in the expenses of manufacture and distribution of £13,366; so that there is a decrease in the gross profit of about £930. The percentage of unaccounted-for gas has been reduced from 5·9 to 5·12; but Mr. Webb remarks that the other working results are not quite up to the usual level, owing to the poorer quality of the coal supplied during the year. The total make of gas was 312,263,000 c.ft., for which 17,767 tons of coal were carbonized, and 103,094 gallons of oil used. The coal gas made per ton carbonized was 12,330 c.ft. The net proceeds of residuals on the cost of coal and oil was 57·48 p.ct. After making the usual deductions for income-tax, annual instalments of loan, and interest, there is a surplus on the year's working of £2682.

Gas Oil.—The "Petroleum Times" says the nominal price is 1s. 4d. per gallon net; but "there is very little offering."

Bland Light Syndicate, Ltd.—The twelfth annual general meeting of the Syndicate was held on Friday, the 16th inst., at No. 29, Little Trinity Lane, E.C. The Chairman (Mr. F. J. Gould), in proposing the adoption of the Directors' report and the accounts, referred to the Company's financial position generally, and paid tribute to the loyal staff under his direction, whose efforts were largely responsible for the excellent balance-sheet. A final dividend was declared at the rate of 14 p.ct. per annum (making 10 p.ct. for the year) and a bonus of 2s. per share.

Townsville (North Queensland) Gas and Coke Company, Ltd.—In their 39th annual report (for the year ended March 31), the Directors were able to report an increase over the previous year in the quantity of gas made of 5·5 p.ct. The cost of coal and labour has increased; and in November last the Company applied to the Gas Referees for authority to institute a new rate of charge. As the result, an increase to 12s. 4d. per 1000 c.ft. was authorized; but so far the higher rate has not been levied. During the year, the management successfully kept up the supply of gas, without restriction, through both the seamen's and the engineers' strikes, each of which lasted for a period of about thirteen weeks. Credit is given to the engineering staff for their efforts in successfully manufacturing gas from wood, coal tar, and coke. They were instrumental in keeping the supply of gas maintained to the public, when gas coal was not available. The profit for the year, after making due provision for depreciation, bad debts, &c., was £7137. A dividend of 6 p.ct. for the year was declared, £1000 was transferred to the reserve fund, and £1200 to reserve for taxation, leaving £823 to be carried forward.

Tully Plant for Selkirk.—The Selkirk Gas Company are installing a Tully carburetted hydrogen gas plant, at an outlay of £3000. The profit for the past year amounts to £1926, and a dividend of 5 p.ct. is declared. A sum of £450 is credited to depreciation. The increase in gas consumed last year was 4½ million c.ft.

Brechin Gas Company.—The Company have a balance at credit of profit and loss account, after providing for depreciation and interest on preference shares and debentures, of £1408. A dividend is paid of 2s. per share, less income tax, leaving a balance of £148 to be carried forward. The report shows an increase of 2 million c ft. of gas consumed, and a substantial advance in revenue from residuals.

Hamilton Gas-Works Report.—The Gas Committee's report to the Hamilton Town Council shows a net balance of £3218, inclusive of £1471 brought forward from the previous year. A sum of £2500 is paid to the Common Good, and the balance of £718 carried forward. It was stated that the results were very satisfactory, enabling a reduction of 5d. in the pound to be made on the rates of the town. Prospects are good. There is no increase in the price of gas.

Gas for Cooking only at Bishop's Castle.—The question of the gas supply continues to occupy the attention of the inhabitants generally and the Bishop's Castle Town Council in particular—so much so that the Council held a special meeting last Thursday night to consider the question. The present owner of the works (Mr. Wenman) has intimated that he does not intend to make gas for illumination, but only for cooking purposes. This proposed change will entail much inconvenience, as well as considerable loss, to those who have purchased their own gas-fittings, fires, &c. The object of the Council is to find out if any condition was imposed when the works were erected as to supplying the town with gas for lighting as well as for cooking purposes. Some time ago, when the proposal to purchase the gas-works was before the Council, it was defeated by one vote only.

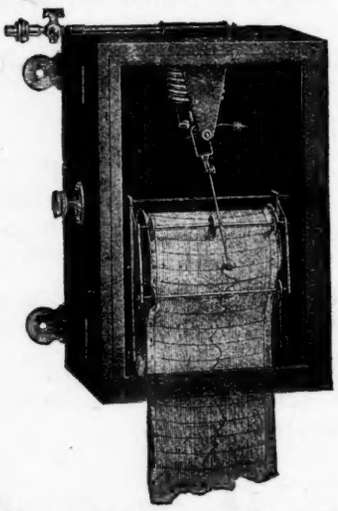
Domestic Training at Aldershot.—The Aldershot Command Domestic Training School is doing great and valuable work in fitting the daughters of soldiers for their important role as the mothers of a future generation, and the careful guardians of British homes. This excellent development forms the subject of an article in the "Aldershot News," in which the writer says that "washing day will be robbed of its discomfort and toil when full advantage is taken of the labour-saving devices now on the market; the daily preparation of meals, which occupy so considerable a portion of every housewife's day, has been vastly brightened by the perfection of the gas cooking-stove; while the more extended use of the gas-fire and radiator will emancipate women still further by eliminating from the home that extravagant dirt producer—the coal grate. The Domestic Training School imbues in the minds of the young pupils the idea that science can help to lighten the toil of the household as much as that of the factory; and time saved from household toil can be devoted with national benefit to the care and training of children."

SIMMANCE'S DEAD BEAT RECORDER

TAPE CHART PATTERN

For Pressure or Vacuum.

NO LIQUIDS USED.



The chart roll is renewed 6 times a year.

The record can be torn off at any interval.

Lowest Range: 0-2 inches water.

Highest Range: 0-300 lbs. per sq. inch.

Suitable for Gas, Air, Water, or Steam, and may be used on Crude Gas.

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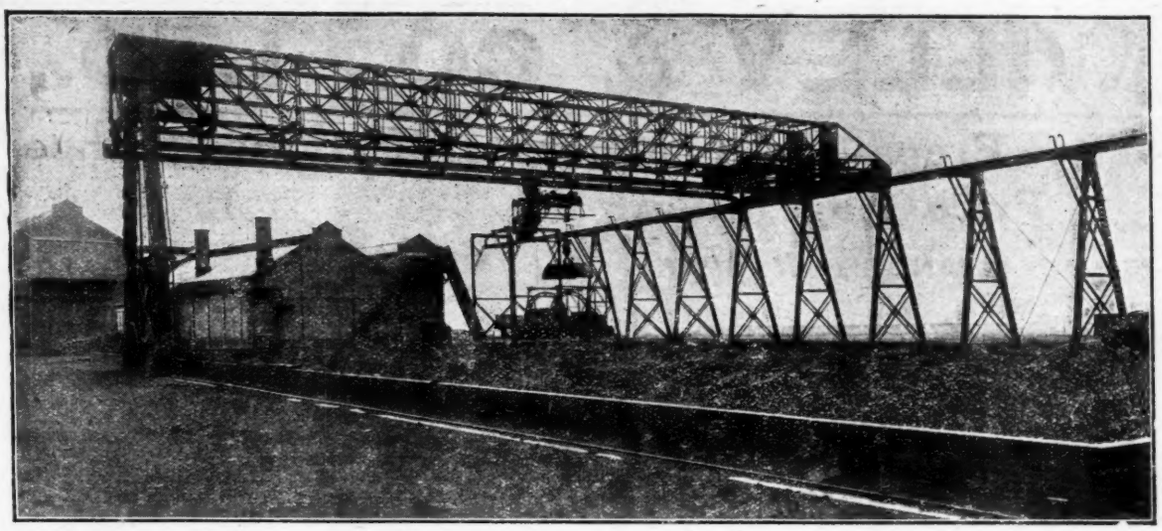

TRAVELLING TELPHER TRACK

FOR HANDLING COAL & COKE OVER EXTENSIVE AREAS—
ANY POINT CAN BE REACHED BY THE TELPHER
& GRAB—HAND TRIMMING IS ENTIRELY DISPENSED WITH.

THE ABOVE PLANT HAS BEEN IN SUCCESSFUL OPERATION FOR 2 YEARS.

STRACHAN & HENSHAW, LTD.

TELEPHONE 432. TELEGRAMS, "STRASHAW." BRISTOL.

The Davis "WEE" and "TWEEN" Cookers.

"WEE" Cooker with Stand and Plate Rack.

"TWEEN" No. 1 Cooker with Stand and Plate Rack.

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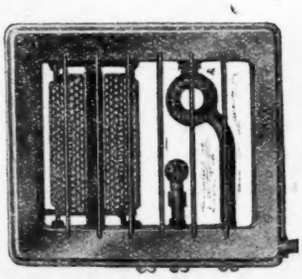

The "WEE" Hot-Plate.

Can be supplied either Double-cased, or Single-cased with Packed Door.

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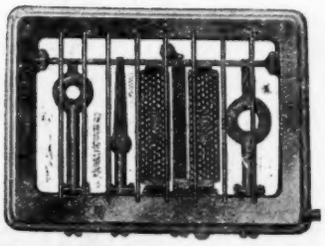


The "TWEEN" Hot-Plate.

WILLEY & CO., LTD.,

The Prepayment Meter with Long Range Price Adjustment

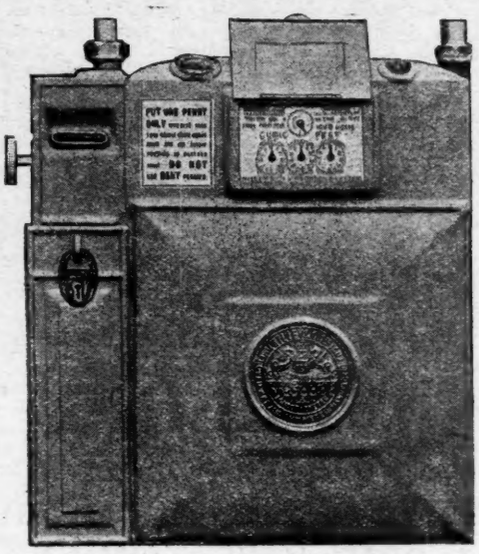
CHANGED *IN SITU.*

(1) No change Wheels required—simply move the pointer on Change Plate to any number from 5 to 43 cubic feet, or correspondingly for 1/- Automatic Meters.

(2) Mechanism secured with or without Seals.

(3) No Springs.

(4) A trial will assure you that you have Strength, Durability, and the last word in Simplicity and Low Maintenance costs.



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Wire - Wilmeter, Manchester.
Phone - 7419 City.

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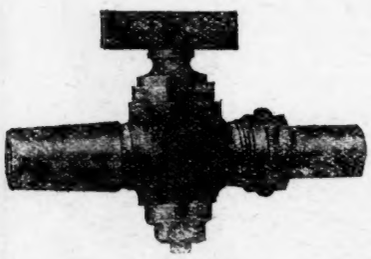
Agents for SCOTLAND: D. M. NELSON & CO., 20, West Campbell Street, GLASGOW.

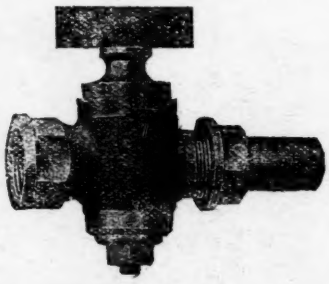
BEST GUN-METAL MAIN TAPS

OBLONG GASWAY.



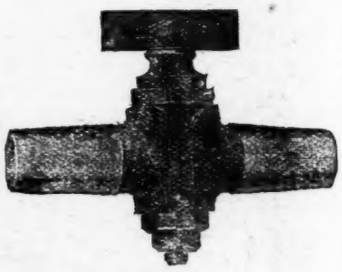
No 66.

ROUND GASWAY.



No. 119.

OBLONG GASWAY.



No. 64.

PRICES ON APPLICATION. —

— SAMPLES ON APPROVAL.

MILES PLATTING, MANCHESTER. **SAWER & PURVES** RADFORD RD., NOTTINGHAM.

(BRANCH OF METERS LIMITED).

Telephone Nos. { 3289 (City) MANCHESTER. / 2025 (Central) NOTTINGHAM.

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Mansfield Gas Undertaking.—The accounts recently printed in relation to the past year's working of the Mansfield gas undertaking show a gross profit of £12,649, and a net profit of £3225. None of this is it proposed to allocate in relief of rates—the whole being devoted to the reserve fund.

Proposed 25 P.Ct. Advance at Halifax.—The Halifax Corporation Gas Committee have, subject to the approval of the Town Council, resolved to make an all-round advance of 25 p.ct. in the price of gas, owing to the increased cost of coal and other materials. The advance will come into force after the September readings of the meters.

Scottish Gas-Works Valuations.—Two valuations are being decided in Scotland by arbitration, the Oversman being Lord Ashmore. The Town Council of Buckhaven, Methil, and Innerleven and the East Wemyss and Buckhaven Gas Light Company, Ltd., is the first case to be heard. The other is the same Corporation against the Leven and Methil Gas Light Company, Ltd. They are both Fifeshire undertakings.

Annual Statement at Oswaldtwistle.—There has been presented to the Oswaldtwistle District Council the seventh annual statement of the Gas Department, which stated that the gas manufactured reached the record of 91 million c.ft. The coal carbonized was 7007 tons, giving a make of gas per ton of coal of 13,025 c.ft. The total working expenses were £20,582, or an increase of £4818; while the net revenue was £25,060, being an increase of £6339. The net profit showed an increase of £1549, £500 of which has been devoted to relieving the rates.

Wolverhampton Boundary Extension Proposal.—In connection with the proposed extension of the borough boundary of Wolverhampton, Mr. P. G. Winstanley (the Engineer and Manager of the Wolverhampton Gas Company) has addressed a letter to the Urban District Council of Sedgley, one of the neighbouring authorities, to the effect that his Directors view with alarm the proposed inclusion of various local districts within the borough of Wolverhampton, strongly resented the proposal, and expressed the hope that the Sedgley Council will oppose it by every means in their power. The Sedgley Council eventually passed a resolution declining to meet the Wolverhampton Council, or any deputation, to discuss the question.

Barnoldswick Gas-Works Extensions.—An inquiry was held at Barnoldswick last week by Dr. A. W. Brightmore, into the District Council's application to borrow £15,000 for gas-works extensions. It was stated by the Manager (Mr. J. W. Thompson) that the proposed work comprises the addition of eight vertical retorts to the present number of sixteen. Since the installation of vertical retorts in 1913, the gas make has steadily increased; the increase during the past eight years being 50 p.ct. The existing plant, owing to the poor quality of coal, cannot maintain the 500,000 c.ft. per day production for which it was designed; and there are additional demands for domestic and industrial purposes. Otherwise the plant has given every satisfaction.

The gas strike in Melbourne has now been finally settled, and the men have returned to work. The terms of settlement are on a basic wage of 13s. a day.

The Middlesbrough Corporation are to make application to the Ministry of Health for sanction to issue £1,250,000 stock. Of this, a sum of £112,450 is earmarked for gas purposes.

The Galashiels Gas Light Company have a profit for the year of £2903. A dividend of 5 p.ct. (free of tax) is paid, and a sum of £803 carried to the reserve fund. The price of gas is the same as last year—5s. 2d. per 1000 c.ft.

The Slaithwaite Urban District Council have applied to the Huddersfield Corporation Gas Committee for an extension of gas-mains to Holthead; but the Committee have resolved that, owing to the prohibitive cost, the application cannot be granted.

Public lighting had to be suspended last week in Rathmines, Pembroke, and Blackrock (co. Dublin), because of a strike of municipal employees. A settlement was afterwards reached, though not until much serious inconvenience had been experienced.

Workmen have been engaged for some time at O'Connell Bridge, Dublin, in replacing the temporary circular gas-main between the southern and northern areas by a large square main. The temporary main has been in use since the period of the insurrection in 1916.

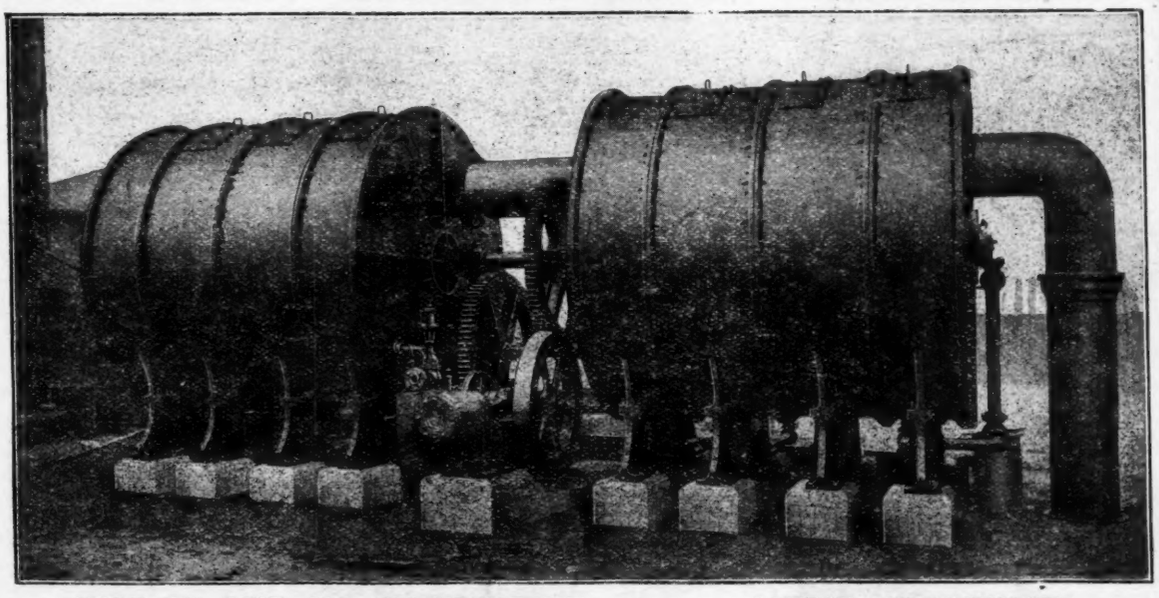
At a meeting of the Council of the Cleveland and Durham Blast Furnacemen and Cokemen's Association held at Middlesbrough last week, it was reported that a claim had been made for payment for working holidays and week-ends for all men on net rates working on and about blast-furnaces and coke-oven plants.

Damage estimated at £700 was done at the bye-product works of Messrs. Samuelson and Co., of Middlesbrough, on Wednesday last through a railway truck of naphthalene catching fire—caused, it is supposed, by a spark from a passing engine. Buildings became ignited; and the burning naphthalene destroyed 50 yards of permanent way.

A new pamphlet on "High-Pressure Gas Distribution and Boosting" has just been prepared by the Bryan Donkin Company, Ltd., of Chesterfield. All kinds of appliances for use in connection with high-pressure gas supply are described and illustrated; and much valuable information is given with regard to a number of installations. There are a few introductory notes on recent developments in gas distribution.

The "Evening Star" Golfing Society held their annual meeting at the Croham Hurst Golf Club on Wednesday, the 21st inst. A considerable number were present to take part in the competition for the "Davis Cup." Bro. Packham was the winner, with a score of 83. Bro. Cyril Davis and Bro. Silk were second and third, with scores of 84 and 85 respectively. At the luncheon, Bro. Packham presented Bro. Davis with a handsome silver replica. Despite the unsettled state of the weather, a most enjoyable day was spent.

ROTARY SCRUBBER WASHERS



MADE TO SUIT ALL REQUIREMENTS. LATEST IMPROVEMENTS.

R. & J. DEMPSTER, LTD., MANCHESTER.

LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for July 21.]

Nos. 20,353—21,591.

ALLGEMEINE ELEKTRICITÄTS-GES.—"Coin-freed meter for gas, &c." Nos. 20,636, 21,077, 21,078.

APPLEBY, E. G.—"Apparatus for agitating fuel in gas-generators." No. 20,496.

ARNDT, M.—"Gas-analyzing apparatus." No. 20,902.

BENTLEY, G. H.—See Appleby. No. 20,496.

BERGIUS, F.—"Manufacture of liquid or soluble organic compounds from coal." No. 20,383.

BIRKHOLZ, A.—"Production of illuminating gas by distillation of coal." No. 20,658.

BOOTHROYD, A. W.—"Gas-stoves." No. 20,946.

BURKHARDT, E.—"Gas soldering-tool." No. 20,939.

BURN, R. G. L.—"Joints for pipes." No. 21,398.

CHENARD, E. A. R.—"Separation of liquids from gases, &c." No. 20,647.

DESSY, F.—"Furnaces for distillation of fuels." No. 20,622.

DEUTSCHE MASCHINENFABRIK AKT.-GES.—"Apparatus for separating solid substances from gases, &c." No. 20,633.

DEUTSCHE MASCHINENFABRIK AKT.-GES.—"Process for removing dust from filters in dry gas purifying plants." No. 20,630.

DEUTSCHE MASCHINENFABRIK AKT.-GES.—"Apparatus for cleaning gases, &c." No. 20,985.

DOWLER, W.—"Fuel for gas-fires." No. 21,500.

DUGON, A. L.—"Recording pressure-gauges, &c." No. 21,306.

FALK, C.—"Manufacture of tar." No. 20,609.

GARROW, J. R.—"Apparatus for destructive distillation of carbonaceous material, &c." No. 21,558.

GIBB, D. M.—"Gas-burners." No. 21,521.

GLASGOW, A. G.—"Heating value indicator for illuminating gas." No. 21,415.

GLOVER, W. R.—"Coin-freed apparatus." Nos. 21,559, 21,561.

GLOVER, W. R.—"Coin-freed gas-meters." No. 21,560.

GRIGGS, A. R.—"Production of hydrogen." No. 20,746.

GUINNESS, A. T.—See Dowler. No. 21,500.

GUNTHERBERG, H.—"Adjustment of apparatus for regulating mixture of gases, &c." No. 20,971.

HENDRICKSON, A. V.—"Accessories for instruments recording percentage volumes of constituent gases." No. 21,488.

HENNEBUTTE, H. G.—"Vertical retort." No. 20,777.

HICKINBOTTOM, F.—See Gibb. No. 21,521.

HILL, J.—"Flexible diaphragms of dry gas-meters." No. 20,469.

HOWLETT, W. N.—See Boothroyd. No. 20,946.

IRELAND, J.—"Means for automatically controlling gas supply to gas-heated flat-iron." No. 21,153.

IVERS, D.—See Hill. No. 20,469.

JUNKERS, H.—"Means for preventing condensation of moisture from combustion or heating gases." No. 20,719.

KOCH, M.—See Guntherberg. No. 20,971.

LEVI, H.—"Artificial lighting and shading thereof." No. 21,416.

LOVELL, A.—"Incandescent gas-burners, &c." Nos. 21,435, 21,436.

MITCHELL, J. B.—"Lamps or burners for incandescent gas lighting." No. 21,158.

MORRIS, B. R.—"Geyser." No. 21,347.

NIELSEN, H.—See Garrow. No. 21,558.

NORDENSSON, C. O.—"Gas-burners." 20,555.

PARKINSON STOVE COMPANY.—See Gibb. No. 21,521.

PINTSCH AKT.-GES.—"Apparatus for measuring flowing gases." No. 20,569.

PINTSCH AKT.-GES.—"Gas-producers." No. 20,577.

PINTSCH AKT-GES.—"Gas-operated flash-light apparatus." No. 20,582.

RIEDEL, A.—"Recovery of nitrogen compounds from coal, &c." No. 20,603.

RIEDEL, A.—"Manufacture of compounds of nitrogen." No. 20,604.

RIEDEL, A.—"Manufacture of coke for blast furnaces." No. 20,605.

RIEDEL, A.—"Recovery of ammonium chloride from fuel." No. 20,606.

RIEDEL, A.—"Recovery of nitrogen from fuel." Nos. 20,607-8.

SCHERK, I.—"Fractionated distillation of poor fuels." No. 20,570.

SCHNEIDER ET CIE.—"Gas-turbines." No. 21,173.

SMITH, J.—"Incandescent gas-lamps." No. 21,145.

STAMP, E. S.—"Incandescent gas-burners. &c." No. 21,435.

STETTINER-CHAMOTTE-FABRIK AKT.-GES. VORM. DIDIER.—"Doors for coke-ovens, retorts, &c." No. 21,174.

UNION APPARATEBAU GES.—"Testing gas mixtures." No. 20,586.

WESTFÄLISCHE GASGLÜHLICHT FABRIK F. W. & DR. C. KILLING.—"Lamp for upright incandescent gas-light." No. 20,821.

WHIMSTER, J. I.—See Glover. Nos. 21,559-60-61.

The Berwick Gas Company, at their meeting last week, decided to pay a dividend of 9 p.ct.; and a sum of 20 guineas was voted to each of the three war memorials in the borough.

The Hove fire brigade were last Thursday called to a house which was filled with smoke; and they found that the floor boards and joists beneath a large gas-cooker had become ignited. The stove had to be disconnected before the flames could be extinguished.

Much interest was taken in recent demonstrations in the showrooms of the Alliance and Dublin Consumers' Gas Company, D'Olier Street and Hawkins Street, Dublin, in connection with the Richmond "Economic" boiler and its use with gas instead of coal.

The "St. Andrew" Gas-Steam Radiator.

A point worth noting.

The real value of the "St. Andrew" Gas-Steam Radiator lies not only in the moderate amount it *costs*, but much more in the large amount it *saves*. For instance:—

It is installed at a less expense than is incurred in any other efficient warming system.

Its maintenance cost is practically negligible.

The Automatic Valve prevents the burning of gas not really needed to attain or maintain a reliable, warm, healthy, agreeable temperature in the room.

It saves Labour. After once lighting the gas no further attention is necessary until the gas can be turned out again. Storing and carrying coal, making fires, clearing away cinders and dust are altogether abolished.

It saves working space in the room where it is used in ways that coal fires never can.

MANUFACTURED BY

JOHN WRIGHT & CO.,

ESSEX WORKS, ASTON,

BIRMINGHAM.

STOCK MARKET REPORT.

THE Stock Exchange has had but an indifferent week under the influence of several disquieting factors, comprising domestic troubles in addition to the nightmares of Ireland, Eastern Europe, and Western Asia. Dulness and increasing weakness were the ruling characteristics of markets almost from start to finish. The gilt-edged market was weak, with but few exceptions. In Home Government issues, Consols and War Loan receded, but Funding and Victory closed unchanged; Friday's figures being: Consols 46¼-47, War Loan 84⅜-85¼, Funding 69¼ 70, Victory 77⅛-78. Even Bonds gave way at last; but new Corporations held on pretty well. Indian also made some advance. Home Rails were depressed by their own special troubles. There was some rise in Canadians; but Argentines were lower. The Foreign Market moved irregularly, and mostly closed easy. French, Italian, and S. Americans were down; but Chinese and Japanese were firm. The Miscellaneous Market had not very many bright spots. Rubbers and Oils were decidedly weaker; Textiles gave way under realizations to secure profits; and Iron and Steel and Shipping lacked support.

Business in the Gas Market was fairly up to the moderate standard of activity ruling lately, especially considering the imminence of the vacation season. The general tendency was steady, and quotations underwent hardly any variations. Gas Light ordinary was fairly steady at between 58 and 60¼ up till Friday, when it slipped a point. South Metropolitan was firm and unchanged. In Suburbans, Wimbledon was a little easier. In Continentals, Europeans changed hands at rather better prices. Imperial was almost overlooked—one single transaction *per diem* being the sum total of business marked, with the quotation lowered 1. Primitivas shrank below their already attenuated proportions.

Bargains done for cash during the week were as follows: On Monday, Commercial 4 p.ct. 53¼, European 5 15/16, 5⅛. Gas Light ordinary 59½, 59¾, 60, 60¼, ditto debenture 47½, Imperial Continental 125, Primitiva preference 32s. 6d., 33s. 1½d., South Metropolitan 59½. Croydon 4 p.ct. debenture 58, Southend B 47, 47½. On Tuesday, Brentford A 49, Gas Light ordinary 59, 59¼, 59½, 60, ditto preference 57½, ditto debenture 48, Imperial Continental 126, Primitiva 12s. 6d., ditto preference 30s., 33s. 1½d., South Metropolitan 60½, Tottenham "B" 53, 53¾, Wimbledon, Epsom 59½, 60, Croydon 5 p.ct. debenture 70, Colonial 12s. 6d., 13s., ditto 7 p.ct. preference 14s., 14s. 6d. On Wednesday, Commercial 4 p.ct. 53⅛, 53½, Continental Union 27, Gas Light ordinary 58½, 59, 59¼, 59⅞, ditto maximum 41½, ditto preference 57½, Hong Kong 8⅞, 9, Imperial Continental 124, South Metropolitan 59, 60, 60½, ditto debenture 46½, South Suburban 63½, 65, Croydon 5 p.ct. debenture 71. On Thursday, European 6½, Gas Light ordinary 58, 58⅛, 58½, 59, 59¼, ditto preference 57⅛, 58⅛, 58¼, ditto debenture 48½, Imperial Continental 125, Primitiva 11s. 3d., ditto preference 30s., ditto debenture 69½, 70, South Metropolitan 58½, 59, 59¼. On Friday, Bournemouth B 9⅜, ditto preference 8 15/16, ditto debenture 46½, 47, Buenos Aires debenture 45, Continental Union 25, European 5⅞, Gas Light ordinary 57, 57⅛, 58⅜, 58½, ditto preference 57½, ditto debenture 47⅞, 47½, 48¼, Imperial Continental 125, Primitiva preference 32s. 6d., South Metropolitan 58, 59, 59½, 60.

In the Money Market, there were ample supplies to meet all requirements for the greater part of the week; but a demand arose later, and rates hardened, though not to any serious extent. Discount rates were steady, with but little variation all the week. The Bank rate is 7 p.ct., as fixed on April 15.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref. .	...	58—63	...
1,551,868	,,	Mar. 26	2½	3 1/16%	Alliance & Dublin Ord.	59—64	42—47	...
374,000	,,	July 14	4	4%	Do. 4 p.c. Deb.	76—79	55—60*	...
280,000	5	May 13	7½	8%	Bombay, Ltd. . . .	5½—6½	4½—5½	...
50,000	10	Feb. 26	16	10%	Bourne- (10 p.c. . .	29—30	8½—9	...
383,110	10	,,	7	7%	mouth Gas (B 7 p.c. .	15—15½	9—10	9⅛
115,000	10	,,	6	6/-	and Water (Pref. 6 p.c.	13½—14	8—9	8 1/16
162,065	—	June 25	—	4%	(4 p.c. Deb.	...	62—64	46¼—47
992,045	Stk.	July 14	14	30/-	Brentford A Consolid. .	261—266	45—50*	49
734,920	,,	,,	11	26/3	Do. B New . .	204—209	43—48*	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	68—73*	...
221,400	,,	June 10	4	4%	Do. 4 p.c. Deb. .	91—93	63—65	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig. .	208—213	121—126	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	80—85	...
1,287,500	Stk.	Feb. 26	5	5%	Bristol 5 p.c. max. . .	...	...	...
530,000	20	April 14	12½	10%	British	44—45	22—24	...
120,000	Stk.	June 25	4	4%	Do. 4 p.c. Deb. Stk.	88—90	57—59	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	45—48	45
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	,,	—	4½%	Do. 4½ p.c. Pref. .	4—6	5½—6½	...
100,000	Stk.	June 25	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	56—61	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	...	...
1,513,280	,,	Feb. 26	5/9/4	33/4	Commercial 4 p.c. Stk.	106—108	51—56	53¼—53½
560,000	,,	,,	5½	26/8	Do. 3½ p.c. do.	103—105	44—49	...
475,000	,,	June 10	3	3%	Do. 3 p.c. Deb. Stk.	69¼—71¼	45—47	...
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	27—32	25—27
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	40—60	...
51,600	,,	Feb. 26	14½	10½%	Croydon A 10 p.c. . .	...	130—140	...
278,400	—	,,	11½	7½%	Croydon B and C 7 p.c.	,,	90—100	...
492,270	Stk.	—	6	5%	Derby Con. Stk. . .	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd. . . .	17½—18	5½—6½	5 1/16—6½
16,298,975	Stk.	Feb. 12	4/17/4	30/-	Gas (4 p.c. Ord. . .	98—102	55—60	57—60¼
2,600,000	,,	,,	3½	26/8	Light (3½ p.c. max. .	76—79	40—45	41½
4,062,235	,,	,,	4	4%	and (4 p.c. Con. Pref.	96—99	57—60	57½—58½
4,674,850	,,	June 25	3	3%	Coke (3 p.c. Con. Deb.	72½—74½	46—49	47½—48½
130,000	,,	Dec. 11	10	10%	(10 p.c. Bonds. .	...	...	...
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	55—60	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	38—43	...
70,000	10	May 13	11	7%	Hongkong & China, Ltd.	16½—16¾	8½—9½	8⅝—9
86,600	Stk.	Mar. 11	9	6½%	Hornsey 7 p.c. . . .	...	88—93	...
131,000	,,	,,	7½	5½%	Ilford A and C . . .	151—154	86—91	...
65,780	,,	,,	6½	4½%	Do. B	115—118	65—70	...
65,500	,,	June 25	4	4%	Do. 4 p.c. Deb. . .	92—94	55—58	...
4,940,000	,,	May 14	9	4½%	Imperial Continental .	150—160	124—129	124—126
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	80—85	...
235,242	,,	Mar. 26	6½	5½%	Lea Bridge Ord. 5 p.c. .	119—121	80—85	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. (A.	211—213	...	...
					(B.	146—148		...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Feb. 26	7/5/6	3½%	Maidstone 5 p.c. . . .	...	52—57	...
75,000	5	June 11	6	3%	Malta & Mediterranean	4¼—4½	1½—2½	...
250,000	100	April 1	4½	4½%	Met. of (4½ p.c. Deb.	99—101	89—96	...
541,920	Stk.	May 27	4	6%	Monte Video, Ltd. . .	11½—12	70—75	...
1,875,892	,,	Feb. 26	4½	3½%	Newcastle & Gatsh'dCon.	98¼—99¼	61½—62	...
529,705	,,	June 25	3½	3½%	Do. 3½ p.c. Deb.	82—83	50½—52½	...
15,000	10	Mar. 11	—	8½%	North Middlesex 10 p.c.	...	13—13½	...
55,940	10	,,	7/14/0	6½%	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	May 13	8	8%	Oriental, Ltd. . . .	117—122	102—105	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7¾	2—3	...
60,000	50	Mar. 11	13	7½%	Portsea Island, B . .	128—131	66—71	...
100,000	50	,,	12	6½%	Do. C . .	118—121	53—58	...
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	⅛—1	11/3—12/6
499,960	5	June 26	5	—	Do. 5 p.c. Pref. .	4½—5	1½—2	30/—33/1½
521,600	100	June 1	4	4%	Do. 4 p.c. Deb. .	91—93	69—71	69½—70
600,000	Stk.	Jan. 29	4	4%	Do. ,, ,, 1911	...	47—50	...
346,198	,,	June 25	4	4%	River Plate (4 p.c. Deb.	85—87	45—48	...
150,000	10	Mar. 26	6	6/-	San Paulo (6 p.c. Pref.	10½—11	6½—7½	...
125,000	50	July 2	5	5%	(5 p.c. Deb.	47—49	38—40	...
135,000	Stk.	Mar. 11	10	50/-	Sheffield A	223—224	68—73	...
209,984	,,	,,	10	4½%	Do. B	222—224	58—63	...
523,500	,,	,,	10	35/5	Do. C	220—222	54—57	...
133,201	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c. . .	...	...	...
90,000	10	June 25	9	9%	South African	10½—11½	11—12	...
6,609,895	Stk.	Feb. 12	5/4/0	30/-	South Met. 4 p.c. Ord..	111—113	56—61	58—60½
250,000	,,	July 14	—	5%	Do. Pref.	...	91—93*	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb..	72½—74½	45—47*	46½
224,820	,,	Feb. 26	8½	3%	South Shields Con. Stk.	157—159	99—101	...
1,087,795	,,	Aug. 14	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	62—67	63½—65
247,558	,,	June 25	5	5%	Do. 5 p.c. Deb. Stk.	116—118	71—76	...
647,740	,,	May 13	7½	3½%	Southampton Ord. . .	99—102	57—60	...
121,275	,,	June 25	4	4%	Do. 4 p.c. Deb. Stk.	...	59—61	...
120,000	,,	Aug. 14	—	3½%	Tottenham (A 5 p.c. .	135—138	60—65	...
782,275	,,	,,	6	2½%	District (B 3½ p.c. .	115—117	52—57	53—53½
181,255	,,	June 10	4	4%	(4 p.c. Deb.	87—89	60—63	...
182,380	10	Dec. 30	5	—	Tuscan, Ltd. . . .	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Mar. 11	5	3½%	Tynemouth 5 p.c. max.	108½—109	71—73	...
					Wandsworth, Wimble-			
					don, and Epsom—			
30,000	,,	Feb. 26	8½	55/-	Wandsworth A 5 p.c.	151—156	83—88	...
255,636	,,	,,	6½	40/-	Do. B 3½ p.c.	129—134	61—66	...
108,075	,,	,,	—	38/6	Do. C . . .	...	61—66	...
140,865	,,	,,	—	38/6	New Ordinary . . .	...	61—66	...
352,000	,,	,,	6½	33/9	Wimbledon 5 p.c. . .	117—122	58—63	...
98,000	,,	,,	6½	40/-	Epsom 5 p.c. . . .	121—126	58—63	59½—60
88,416	,,	June 25	3	3%	3 p.c. Deb. Stk. . .	66—69	44—47	...

*Ex Div.

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